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# INDIAN EDUCATIONAL REVIEW

•**PURPOSE** *Indian Educational Review* is published quarterly in January, April, July and October, by the National Council of Educational Research and Training, New Delhi. The purpose of this journal is to provide a medium for this dissemination of educational research and exchange of experience among research workers, scholars, teachers and other interested in educational research and related fields and professions.

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## Effective Concept Learning in Science Education : A Theoretical Instructional Model

RADHA MOHAN

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**E**DUCATION (learning and instruction) is a rational enterprise, which can be evaluated continually and made more effective and efficient. The study of learning involves the interactions between the learner, the learnings and the learning environment.

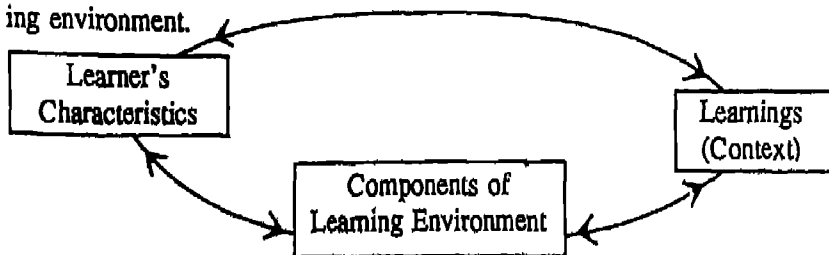


FIG. 1, Factors of Learning Context

A distinction must be made between learning which is a process and the learner who benefits by this process. While learning is influenced by socio-cultural fac-

tors and by the educational environment like school ethos, curricular experiences and class interaction plus the home environment, the learner himself is a bundle of various traits, capabilities, aptitudes, which through interaction with his environment, shape him.

The process of learning is generally supported by a variety of media to provide information and to help the learner to organise his or her strengths and weaknesses; so media are selected to match specific learning situations and blended so that the weaknesses in one are offset by the strengths of another.

A useful definition of instructional technology is the statement of the Commission on Instructional Technology (1970)— "...instructional technology goes beyond any particular medium or device. In this sense, instructional technology is more than the sum of its parts. It is a systematic way of designing, carrying out, and evaluating the total process of learning and teaching in terms of specific objectives, based on research in human learning and communication, and employing a combination of human and non-human resources to bring about more effective instruction...". This definition implies that, for improvement of instruction, systematic planning and the wise and skilful use of the products of technology are the basic prerequisites.

Instructional technology, in this paper, refers to a systematic method of designing instruction that often incorporates a variety of innovative communication media. Psychological principles of learning that have been influential in the development of instructional technology are the ideas that active learning is better than passive learning, practice and feedback improve performance, rewards facilitate learning, individuals differ in their learning styles and abilities, and learning involves feelings and social factors as well as cognitive skills. Many types of instructional technology attempt to incorporate some or all of these principles. Instructional technology is fundamentally aimed at improving the efficiency of educational systems by increasing the rate, depth, precision and value of the learning which takes place. Emphasis is on the learner's involvement, interaction with the instructional material, retention and future application.

This paper presents a theoretical model based on current learning theory, prevailing instructional strategies and technological developments as applied to science education. The proposed theoretical model focuses upon the components of the learning environment which include interactions among teaching methods, teaching materials, teaching techniques and presentation modes. Considerations of learning, individual capacities, motivation, personality, growth of thinking skills, 'readiness' are all major issues in devising learning experiences for pupils. The student is no longer a passive receptacle in learning what is being imparted; he/she is, on the other hand, an active participant in the learning process. The incorporation of rational thought, theory and empirical evidence is critical in the design of instructional systems and provide a means to investigate specific, delineated dimensions of the instructional systems.

## LEARNING CONTEXTS

Learning is a key process in human behaviour. It pervades everything one thinks and does. Learning is defined as a change in the individual's cognitive structure, one's previously acquired storage of information. It is assumed that learners interact actively with the environment and construct meaning from their experience. The work of Ausubel (1968), Bruner (1960), Dienes (1971), and Piaget (1969) is representative of this perspective.

Much of the instruction that occurs in schools consists of the learning of concepts. Definitions that students are given may be inadequate because they do not articulate the relevant attributes. The examples that are provided may not clearly contrast the relevant and irrelevant attributes. Indeed, some instruction may not even include non-examples, promoting only a superficial understanding of concepts.

Educators have generally accepted a model of concept development based upon a progression from concrete to quasi-concrete to abstract representation. Piaget's (1969) stages of development (sensorimotor, preoperational, concrete operational and formal operational) and Bruner's (1960) stages to represent the world (enactive, iconic and symbolic) support this view. This has been translated into instructional practice as manipulation of concrete objects, pictorial or graphic representational and finally symbolic form.

Figure 2 depicts how this concrete-to-abstract learning takes place. The inverted triangle at the left reveals how the pupil (in a diverging manner) begins with few or no true concepts and gradually builds from primitive concepts—which are narrow in scope and simple in nature—to a larger range of increasingly complex and inclusive concepts. The means by which the pupil acquires this learning proceed in a converging manner (the right-side triangle). He must have many and diverse opportunities for concrete and direct experience from which to build concepts. Only gradually does he become less dependent on these experiences in order to acquire new concepts. Finally, he can expand his understanding of his world through indirect experience derived from symbols.

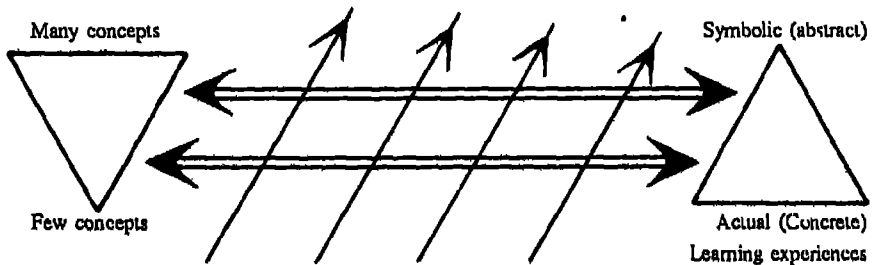


FIG 2. The Interrelationships of Concrete, Quasi-concrete and Abstract Learning Experiences with Concept Formation

Ideally, the teacher recognises that pupils who are relatively low on the concept scale, need to have a maximum of new learning opportunities present in concrete situations. As pupils advance higher on this scale, more abstract experiences provided through more abstract symbolic or verbal experiences may prove to be appropriate. Progress in the concept scale may move in varied direction. Often a student's progress seems to be arrested when in fact the pupil has only temporarily returned to basic, direct experiences in order that he may fill important gaps in understandings.

Wittrock's (1978) generative model of learning suggests that learners generate associations between stimuli and prior learning and that both prior concrete experiences and verbal abilities are used to construct these associations. Instruction that involves different methods for different learners in different situations facilitates the generative process.

Salomon (1985) suggests that representational level is a basis for describing and differentiating forms of instructional media. Figure 3 provides examples of dimensions that could be used for instructional model development.

Concrete	—	Quasi-concrete	—	Abstract
Passive	—	Reactive	—	Active
Reception	—	Reception within certain limits	—	Selection
Random	—	Random within fixed domain	—	Fixed
Manipulated	—	Animated	—	Static
Teacher determined	—	Teacher/Learner determined	—	Learner determined

FIG. 3. Dimensions for Instructional Model Development

The proposed instructional model attends to the dimensions of representational level of concept (concrete—quasi-concrete—abstract) and locus of control (passive—reactive—active) as illustrated in Figure 4.

		→ Representational Level of Concept		
		Concrete	Quasi-concrete	Abstract
Locus of Control	PASSIVE	concrete—passive	quasi-concrete—passive	abstract—passive
	REACTIVE	concrete—reactive	quasi-concrete—reactive	abstract—reactive
	ACTIVE	concrete—active	quasi-concrete—active	abstract—active

FIG. 4. Instructional Model—General

These two dimensions were selected because they are consistent with the learning theory and reflect instructional practices valued in the teaching of science: activity-oriented learning, hands-on activities, multimedia environments and learner-centred. Of particular interest is the role of technology in the development and modification of the instructional model and the use of the technology in the design and selection of the instructional materials and activities.

Dimension I, Representational Level of Concept, describes a continuum from concrete to abstract representation. The concrete representational level is simply interpreted as a learning activity which involves concrete objects representing physical entities. The quasi-concrete level involves representation of the objects in the form of pictures, cartoons or images as displayed by media such as television, computer monitors, overhead projectors, filmstrips, films. The abstract representational level engages the learner with ideas, verbal descriptions, and symbolic representation of the concrete or quasi-concrete experiences. Chemical symbols and formulas are examples of the abstract level.

Dimension II, Locus of Control, is a continuum referring to the degree of learner autonomy.

Cronbach and Snow (1977) have attempted to establish principles which would help educators adapt the learning environment to individual differences in perception of control.

Rotter (1966) defines locus of control as an "individual difference variable that describes a subject's perceived expectancy for reinforcement".

The International Dictionary of Education (1985) defines locus of control as "personality construct referring to an individual's perception of the place of events as determined internally by his/her own behaviour against luck, fate or external forces".

Research has shown that internally controlled students are more likely to engage in data-gathering activities and make greater use of information than externally controlled students (Tobin and Capie, 1982).

Horak and Horak (1982) report that research on locus of control supports the findings that students with an external locus of control will excel in high-structure situations while internal students will do better in low-structure situations.

Locus of control is an affective learner characteristic which may account for differences in learning through different modes of the same medium, like computer assisted instruction. Locus of control is, hence, a continuum from passive to active through reactive. It is fundamentally related to two factors: change and the control of that change. In the "passive state" there is no change and evidence of change can only be inferred, not observed, directly. "Reactive" involves an observable change but the control of that change and the factors influencing that change are not controlled by the learner. The change can be controlled by the teacher or by some other means such as a computer programme or a programmed instruction frame. "Active" is a condition involving observable change in which

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the learner actively interacts with the learning environment and, therefore, has a degree of control over the change.

In the context of science education, locus of control, essentially talks about

- (a) an observation of an experiment/phenomenon,
- (b) two or more fixed sets of observations of an experiment,
- (c) a set of observations in a randomly varying experiment.

This process leads to prove the universality of a scientific phenomenon.

This relationship can be represented figuratively as shown in Figure 5.

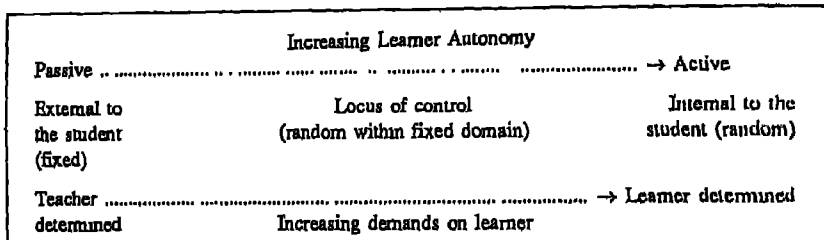


FIG. 5. Locus of Control

At the right end, the student is active, has more control than the teacher, and is able to interpret a set of observations in randomly varying experiment. At the left end, the student is relatively passive; the teacher has more control. For example, a student working in the laboratory would be more active than one observing a teacher demonstrate the same experiment.

## LEARNING MATRIX

The interplay of representational level of concept and locus of control can be depicted in a learning matrix. It is possible to examine various instructional strategies, both conventional and those involving instructional technology in terms of the matrix. The interaction among the levels of Dimension I, Representation of Concept, and Dimension II, Locus of Control, are illustrated by the nine individual cells in the instructional model (Figure 4).

Figure 6 shows the learning matrix with appropriate strategies—both conventional and technological—filled in the nine cells. One point about filling in the cells is that it is much easier to complete the task for less complex types of learning (the top left-hand corner of the matrix) than for learning that is abstract (bottom right-hand corner). It is possible to examine various instructional techniques—both conventional and those involving instructional technology—in terms of the matrix. For example, variety of methods is available for presenting concrete concepts to a passive learner, including the conventional methods of textbooks, lec-

# EFFECTIVE CONCEPT LEARNING IN SCIENCE EDUCATION

tures, and so on, and the instructional technologies of CAI, programmed instruction film, etc. In the case of embedding quasi-concrete concepts to passive learner, this may be accomplished by classroom exercises, rehearsal on the part of the students themselves, CAI drill and practice techniques, and so on.

→ Representational Level of Concept

Locus of Control ← PASSIVE  REACTIVE  ACTIVE	Concrete	Quasi-concrete	Abstract
	Textbooks Lectures with charts	Classroom drill Supervised study Textbooks	Examinations Knowledge and behaviour in real world
	Programmed instruction Radio/TV CAI tutorial	Programmed instruction TV CAI drill	Computer test banks
	Demonstration Tutorials	Observation in real world Demonstration	Knowledge in real life project Problem-solving exercises
	Programmed instruction CAI drill TV	Simulation CAI tutorial	Computer-based problem-solving
	Laboratory exercise (fixed)	Discussion/seminar Laboratory (random within fixed domain)	Knowledge in real world Laboratory (random)
	Computer-based problem-solving Simulation	Simulation Computer-based problem solving	Computer-based problem-solving Simulation

FIG. 6. Instructional Matrix—Appropriate Strategies

Two qualifications are in order about the matrix as a guide to choice of instructional medium. In the first place, the inclusion of particular instructional technologies in some categories is fairly arbitrary, and must remain so until more evidence is accumulated about the effectiveness of different techniques for different types and complexities of learning situations. Secondly, placing various kinds of strategies within a particular cell, does not make them equivalent.

Figure 7 narrows down the matrix in Figure 6 so that only the technological strategies remain in the nine cells.

→ Representational Level of Concept

	Concrete	Quasi-concrete	Abstract
Locus of Control ↓ ACTIVE REACTIVE PASSIVE	Radio CAI tutorials Films	Programmed instruction TV CAI drill and practice	Computer test banks Programmed instruction
	Programmed instruction CAI drill and practice	Simulation CAI tutorial	Computer-based problem-solving TV (e.g. UGC)
	Computer-based problem-solving Simulation Programmed instruction	Simulation Programmed instruction Computer-based problem-solving	Computer-based problem-solving Simulation

Fig. 7. Instructional Model with Instructional Technology only—Representational Level of Concept and Locus of Control

This instructional model can be applied to various curriculum areas and topics. This model (Fig.5) as applied to the concept of flotation is depicted in Figure 8

CONCEPT OF FLotation

→ Representational Level of Concept

	Concrete	Quasi-concrete	Abstract
Locus of Control ↓ PASSIVE  REACTIVE	Learner observes that when a metallic bob and cork are dropped into two different measuring jars with water, the bob sinks and the cork floats	Learner observes the end state of the water displaced by the object experiment	Learner observes table or graph giving the weight of the water displaced and the weight of the object
	Textbook Lecture with charts TV CAI tutorial	Lecture with charts TV	CAI simulation Textbook
	Learner observes a demonstration of the water displaced by object experiment	Learner observes the water displaced by the object experiment	Learner observes the changing values of the volume of the water displaced by the objects of different shapes
	Demonstration CAI tutorial	Simulation Tutorial Observation of readings in demonstration	Problem-solving



ACTIVE	Learner determines the weight of the water displaced by the objects placed in the water, using say, spring balance	Learner determines the weight of the water displaced by the object placed in the water	Learner changes the values in a mathematical model comparing the weight of objects and the weight of equal volume of water
	Laboratory Simulation	Laboratory Simulation	Laboratory Modelling Computer-based problem-solving

FIG. 8. Instructional Model—Flotation Concept (Physics)

Taking Figure 8, at the first level, concrete, the learner is introduced to the concept of different floating bodies of the same material, displacing different volumes of water. The existence of a relation between the weight of a floating body and the volume of water displaced is established.

At the quasi-concrete level, the learner is able to comprehend the relation between the weight of an object and the volume of water displaced.

The abstract level involves the imbibing of the concept that the weight of a floating body is equal to the weight of the volume of water displaced.

Figure 8 shows how the instructional model can be used for a set of concepts in the unit 'Light'. At the first level, the learner is made familiar with the concept of focus; that is, the image of a distant object can be brought to a focus:  $u = \infty$ ;  $v = f$ .

At the quasi-concrete level, the learner is introduced to the concept of  $u = v = 2f$ ; an image of the same size as the object is obtained when  $u = v = 2f$ .

The abstract level leads to the comprehension of the concept of the relationship of  $u$ ,  $v$  and  $f$ ; that is  $\frac{1}{u} + \frac{1}{v} = \frac{1}{f}$ .

In both Figures 8 and 9, CAI refers to computer-assisted instruction, where computers are used to guide the student through prescribed course of learning. There are many modes of use of computer-assisted instruction. These modes involve different relationships between students and the system, and also identify different patterns of interaction. In the drill and practice mode, exercises or problems are stored in the system and presented to the student either on his request or as decided by the teacher. In the tutorial mode of interaction, dialogue is used widely. Information is presented to the student and branching decisions are based on his response. In its simplest form a tutorial resembles a programmed learning sequence. In the simulation mode, the CAI system puts the student through an experience that resembles a natural experience. The student can learn how complex systems develop and work, how to control them, or how to relate to them in an effective way.

The instructional techniques used is a combination of demonstration, laboratory, and CAI. At the quasi-concrete level — reactive phase — a computer simulation could allow for choice of a lens of a particular focal length. The option could result in a ray diagram with the object placed at  $2f$ . Using the cursor keys, the student could move the image till it is the same size as the object. He could measure the distance on the calibrated ray diagram, and verify  $\frac{1}{u} + \frac{1}{v} = \frac{1}{f}$ .

Trying different options, the above concept could be reinforced by the computer simulation. In a CAI tutorial, the learner has less control than the tutor. In a CAI simulation, though it may not be quite learning by doing, the learner has more control, as his options determine the course of the programme.

$$\text{Concept} - \frac{1}{u} + \frac{1}{v} = \frac{1}{f} \text{ Convex Lens}$$

→ Representational Level of Concept

	Concrete	Quasi-concrete	Abstract
<b>PASSIVE</b>	Learner observes the sun's rays brought to a focus where a piece of paper catches fire using a convex lens	Using a candle as an object, an image of the same size as the object, is got on the screen	For different values of $u$ and $v$ a graph is presented of $\frac{1}{u}$ vs $\frac{1}{v}$ . The intercept gives $\frac{1}{f}$ .
	Demonstration Textbook CAI tutorial	Textbook Programmed instruction Demonstration	Textbook Supervised study CAI tutorial
<b>REACTIVE</b>	The image of a distant object, say a tree, is focussed on a screen by convex lens	An object placed at $2f$ produces an image of the same size as the object at $2f$ for a lens	Varying $u$ and $v$ , and using a single lens, the values can be entered in a tabular column and $f$ found
	Demonstration CAI tutorial	Demonstration CAI tutorial CAI simulation	Demonstration CAI simulation
<b>ACTIVE</b>	Using different lenses, the same object can be brought to a focus on a screen at different distances from the lens	Using different lenses, the object and the image are the same size for $u=v=2f$	Varying $u$ and $v$ , and using different lenses, the focal length of different lenses is found $-\frac{1}{u} + \frac{1}{v} = \frac{1}{f}$
	Laboratory CAI simulation	Laboratory CAI simulation	Laboratory CAI simulation Problem-solving

FIG. 9, Instructional Model—Physics Concept

It is highly likely that certain media will be better suited to some instructional objectives than to others. A model will aid the difficult task of choosing an appropriate learning medium. Regardless of the choice that is made, however, the quality of the material — be it a lecture, programmed textbook or film — is of great importance. This seems a fairly obvious part, but it is frequently overlooked in enthusiastic support of a particular medium. In the world of computer-assisted instruction, in particular, there are numerous examples of incredibly sophisticated delivery systems, incorporating multi-coloured graphics, light-sensitive screens, and so on, and yet the material presented by such techniques is often trivial in content.

A related point about the choice of an instructional medium is that, for maximum effectiveness, a particular teaching technique should be deployed for those tasks where it is most needed. For example, a costly medium like TV is probably best suited to distance education, where it can be used to greatly extend the reach of a course, rather than being used primarily as an addition to regular courses offered within conventional educational settings. In considering the relationship between the instructional content and the medium selected to convey that content, the question of the permanence of the material being taught may be vital. When computers were first introduced into American schools in the 1960s, they were used the way filmstrips and learning machines had been: to present lessons that progressed at a pace consistent with a student's ability. Even today a lively market exists for programmes that prepare students for the Scholastic Aptitude Tests or drill them on the multiplication table. But software manufacturers have been less successful in attempts to transfer textbooks onto floppy disks. Texts, after all, usually cost less than \$25 and can be used year after year. Most computerised education programmes, by contrast, cost \$50 to \$100 and provide, at best, only a few hours of enrichment.

Many media that are potentially very effective for capturing student attention and for motivating students (like TV or CAI) suffer in comparison to more mundane media (like books) in that they leave behind no permanent record unless students make their own efforts to provide one in the form of notes.

Not only is it obvious that no one instructional medium is ideal for all learning situations, it is probably true that a good many learning tasks, involving concrete—quasi-concrete—abstract concepts, would benefit from a combination of different instructional strategies.

Support for many of the specific activities outlined in the two instructional models specific to curriculum areas can be found in the literature. Looking into related literature in terms of locus of control, a few points emerge.

The use of variety of manipulative materials and activities has been suggested by Dienes (1971) in his *Multiple Embodiment and Mathematical Variability Principles* in order to facilitate concept abstraction and generalisation. Reys (1971) and Suydam and Dessart (1976) also recommend the manipulation of concrete

objects. The role of visual imagery as advanced by the work of Levin (1976) and Paivio (1971) provides a basis for the activities involving animation. Suydam and Higgin's (1977) further support these activities, as their review indicates that teacher demonstration can be as effective as student representations are supported by the work of Ausubel (1968). He suggests that reception learning, material presented in final form, can be meaningful to the literature.

Research on the instructional uses of the computer has confirmed positive effects. Barcey (1982) found that students generally learn more, learn in less time, and retain more using computers, and that affective and motivational effects are positive. Bork (1979, 1980) has championed the use of computer simulation, analogues of real events, animation, manipulation, interaction and three-dimensionality. Forman (1985) has hypothesised a new representational level resulting from the instructional uses of computers. His term "kinetic print" refers to the interaction with active iconic symbols.

Clearly, the technological explosions warrant investigation and evaluation in terms of instructional uses.

### SUGGESTIONS FOR RESEARCH

The following areas present themselves for research:

1. How does the variation and sequence of activities along the representational level of concept continuum influence the learner's cognitive structure, information processing, and understanding of science concepts?
2. How does the variation and sequence of activities along the locus of control dimension influence the learner's cognitive structure, information processing and understanding of science concepts?
3. Can a sequence of graded activities in terms of levels of representation and movement be identified to help correct misunderstandings about science concepts?

These are but a few of the questions which need to be answered so that instructional systems can be carefully and systematically designed in order to optimise the gains of diverse instructional tools and promote equitable and effective learning.

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## **A Strategy for Mastery Learning—Its Development and Comparison with Conventional Methods**

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**O**VER the past few years, a growing number of teachers have found that the teaching-learning strategies associated with 'mastery learning' provide them with a meaningful solution to the conflicting demands of a classroom situation. To these teachers, 'mastery learning' has provided useful and flexible techniques through which they have been able to better individualize instruction within their group-oriented classroom.

In the present paper a discussion is carried out about the strategy developed for mastery learning in the fifth grade geometry and its effect on the achievement of the students by comparing the achievement scores of the group taught through the developed strategy and the group taught through the conventional method.

The main objectives of this study were (i) to develop a strategy for mastery learning in the geometry course for the pupils of fifth grade, and (ii) to validate the effectiveness of the developed strategy. Here the word mastery learning indicates the level which each pupil attains when he/she is able to give at least 80

per cent correct response to a formative/summative test that has been constructed based on instructional objectives with respect to that unit course which each pupil is expected to achieve.

The instructional strategy developed through the investigation to attain mastery learning comprises of various components which were used according to the demands of the teaching-learning situation. The components employed in suitable combinations in the strategy are as follows: (i) Introduction, (ii) Structured lecture, (iii) Discussion session, (iv) Problem solving, (v) Mathematical models, (vi) Individualised tutorial, (vii) PLM, (viii) Textbooks and workbooks, (ix) Small group study sessions, (x) Mathematical games, (xi) Review and practicing, (xii) Assignments, (xiii) Feedback session, (xiv) Formative and summative tests.

### RESEARCH DESIGN

The present investigation was mainly to see the extent to which the pre-prescribed objectives are achieved by the strategy developed for mastery learning. In order to do this it was decided that this experiment of instructing through the developed strategy be conducted for a group of learners of fifth grade available in a given system without adopting any sophisticated sampling procedures.

The study was basically a developmental effort in that the instructional inputs, hypothesised to have the potential to yield definite results in terms of pupils' achievement, were selected, organised and validated. This effort was made in the actual context without disturbing the setting for experimental purposes, so that all the variables which are normally at play in teaching-learning situations were operative during the investigation. In this way the investigation was designed as per the requirements typical of an 'a-experimental' study (Guba, 1965) where the concern is to carry out investigations under actual field conditions. The study was confined to only two groups in two different schools with which the developed strategy was experimented. However, for comparison purpose, two other comparable groups (one in each of these schools) designated as control groups were also employed on the rationale that they too underwent the same course in the same amount of time but by the conventional method and not through the developed strategy. Thus, in all, there were four groups of fifth grade pupils selected from two schools; two groups in each school so that one was treated as the experimental group and the other as the control group. In each school, the experimental and control groups were matched for the mean and standard deviation for IQ of both the groups. Thus, the design employed for the study did have control groups even though these were not constituted in the strict sense as they would be, had the study been purely experimental; however, treatment comparison was in accordance with the ways adopted in experimental designs. The matched groups were

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compared to study the effectiveness of the developed strategy in terms of scholastic achievement. Also, the relationship between intelligence level and achievement were studied from the data obtained.

The performance of the learner was continuously assessed by administering a formative criterion test after learning each unit of the geometry course through the developed strategy. And at the end, the summative criterion test was administered to the experimental as well as the control group after all the units of geometry course were completely taught. These criterion tests were diagnostic in nature. A descriptive analysis of these criterion test scores reflects the effectiveness of the developed strategy in achieving the instructional objectives. Measures like mean, SD, t-value and percentiles of the criterion test scores indicate the extent of the performance of the learners. A summative test was provided at the end of the geometry course in order to assess the overall performance of the learners.

## SAMPLING

The sample for the initial tryout consisted of 55 pupils in the experimental group and 55 in the control group from Convent of Jesus and Mary school. In the final tryout the sample consisted of 51 pupils of the experimental group and 43 pupils of the control group from Baroda High School.

## PROCEDURE

This study was conducted under three phases. In the first phase the investigator observed the actual teaching-learning process in the fifth grade mathematics classes of the different schools and discussed about the teaching-learning process with different mathematics teachers. This type of observation and discussion helped the investigator to develop an appropriate instructional strategy for employing it is the second phase.

During the second phase, initial tryout was carried out. In this tryout, before starting the experiment, the experimental group was matched with the other group in terms of mean and standard deviation of IQ of both these groups—it being impracticable to set up groups with subjects matched person to person. An intelligence test developed by G.B. Shah was used to find out the IQ of each pupil. Before actual teaching of geometry in the experimental group, the entire course content was arranged in proper sequence and also general and specific objectives were formulated. Then the teaching-learning process was started with the pupils of the experimental group. After completing each unit, the formative criterion tests were administered to the experimental group. These formative criterion tests were developed consulting subject experts and were diagnostic in nature. These tests



helped in checking the learning progress of each pupil and provided feedback to the investigator and the learner. Based on this individual learning difficulties were diagnosed and, accordingly, the specific remedy was prescribed. Here the correctives were alternative learning resources such as the use of PLM, textbook and workbook, preparing mathematical models, etc. After the corrective process was completed, a second formative test was administered to check the success of the correctives used and to ensure that the mastery is achieved by the pupils before introducing the next unit. As the investigator had to take into consideration the time-limit given by the school authorities, not more than two formative tests were conducted for each unit. Instruction for all other units was organised in a similar way, utilizing a suitable combination of techniques and input materials. To maintain the pupils' learning over a long period of time, review and practice were conducted at some intervals. Finally, summative evaluation was done after the completion of all units of the geometry course in the experimental group.

At the same time, the same summative test was given to the control group (which was matched with the experimental group) of the same school to compare the scholastic achievements of both these groups which were taught by different methods by different teachers. The experimental group was taught by the investigator using the developed strategy while the control group was taught by another teacher of the same school using the conventional methods. The results of the initial tryout were helpful to the investigator to modify the developed strategy and to apply it in the third phase, i.e. during the phase of finally tryout.

In the third phase the final tryout was carried out in another school for five weeks. Before starting the experiment, the parents of the pupils were also informed regarding the experiment going on in the school by sending cyclostyled copies of a letter mentioning about the experiment and requesting them to co-operate during the experiment by sending their children regularly to the school. During this phase the strategy developed in the second phase was applied except for some changes in using combinations of instructional components in teaching some concepts of geometry. At the end of the third phase a questionnaire was given to each pupil of the experimental group to know their reactions about the experiment conducted.

## DATA

The data collected during the experiment were mainly in two forms. One was in the form of scores of scholastic achievement in the formative and summative tests, and the second was in the form of answers given to the questionnaire by the pupils of the experimental group. Based on the data obtained, the following tables were prepared which were further analysed and interpreted to validate the strategy. The analysis and discussion/interpretation of the results as well as educational implications are given below.

TABLE 1  
Scholastic Achievement of Pupils at the Final Tryout

Percentiles	Formative Test Scores: Experimental Group (Group A)										Summative Test Score	
	Unit 1		Unit 2		Unit 3		Combined Units: Unit 2 and Unit 3				Experimental Group (Group A)	Control Group (Group B)
	Test 1	Test 2	Test 1	Test 2	Test 1	Test 2	Test 1	Test 2	Test 1	Test 2		
P90	99.75	100	95.80	100	100	100	100	100	97.5	97.5	96.49	82.33
P80	95	100	86	100	100	100	100	100	95	95	92.66	76.66
P70	85	97.50	77.40	93.33	90	100	90	100	90	90	90	70.17
P60	82.50	95	76	93.33	90	100	90	100	90	90	86	65.99
P50	80	95	68	91.67	85	100	85	100	87.50	87.50	82.50	59.17
P40	75	92.50	62	80	75	100	75	100	85	85	80	51.66
P31.37 (Mastery level)	70	90	58	80	70	90	70	90	80	80	80	50.82
P30	70	90	58	80	66.50	90	66.50	90	80	80	78.83	49.83
P20	62.50	85.50	52.80	61.33	60	70	60	70	78	78	75.33	46
P10	57.75	80	46.20	46.66	55	60	55	60	70	70	68.50	41.66
P0	35	45	34	20	26	20	26	20	25	25	50	23
Mean	76.91	90.83	68.59	80.19	77.16	87.45	77.16	87.45	83.77	83.77	82.09	58.95
SD	16.40	10.91	17.16	22.17	21.22	20.75	21.22	20.75	14.09	14.09	10.51	15.77
t	*9.54											

\*at .05 t = 1.99 at .01 t = 2.63

TABLE 2  
Percentile and Percentages Comparison of Achievement Levels of the Pupils in the Summative Test—for the Experimental Group A of both the Tryouts and the Control Group B of the Final Tryout.

Achievement Level	Percentiles of the Pupils Achieving the Respective Achievement Level				% of the Pupils Achieving the Respective Achievement Level			
	Experimental Group (Group A)	Experimental Group (Group A)	Control Group (Group B)	Control Group (Group B)	Experimental Group (Group A)	Experimental Group (Group A)	Control Group (Group B)	Control Group (Group B)
	Initial Tryout	Final Tryout	Final Tryout	Final Tryout	Initial Tryout	Final Tryout	Final Tryout	Final Tryout
Mastery level (i.e. Ach. score $\geq 80\%$ )	P36.36	P31.37	P88.37	P88.37	63.64%	68.63%	11.63%	11.63%
Distinction (i.e. Ach. score $\geq 70\%$ )	P25.45	P11.76	P69.77	P69.77	74.55%	88.24%	30.23%	30.23%
First Class (i.e. Ach. score $\geq 60\%$ )	P8.73	P9.14	P51.16	P51.16	91.27%	96.86%	48.84%	48.84%
Second Class (i.e. Ach. score $\geq 50\%$ )	P6.36	P0	P30.23	P30.23	93.64%	100%	69.77%	69.77%
Pass Class (i.e. Ach. score $\geq 35\%$ )	P0.73		P6.28	P6.28	99.27%		93.72%	93.72%
Failure (i.e. Ach. score $\geq 35\%$ )					0.73%	00%	6.28%	6.28%

TABLE 3  
Values of 'r' for Different Groups at Different Tryouts

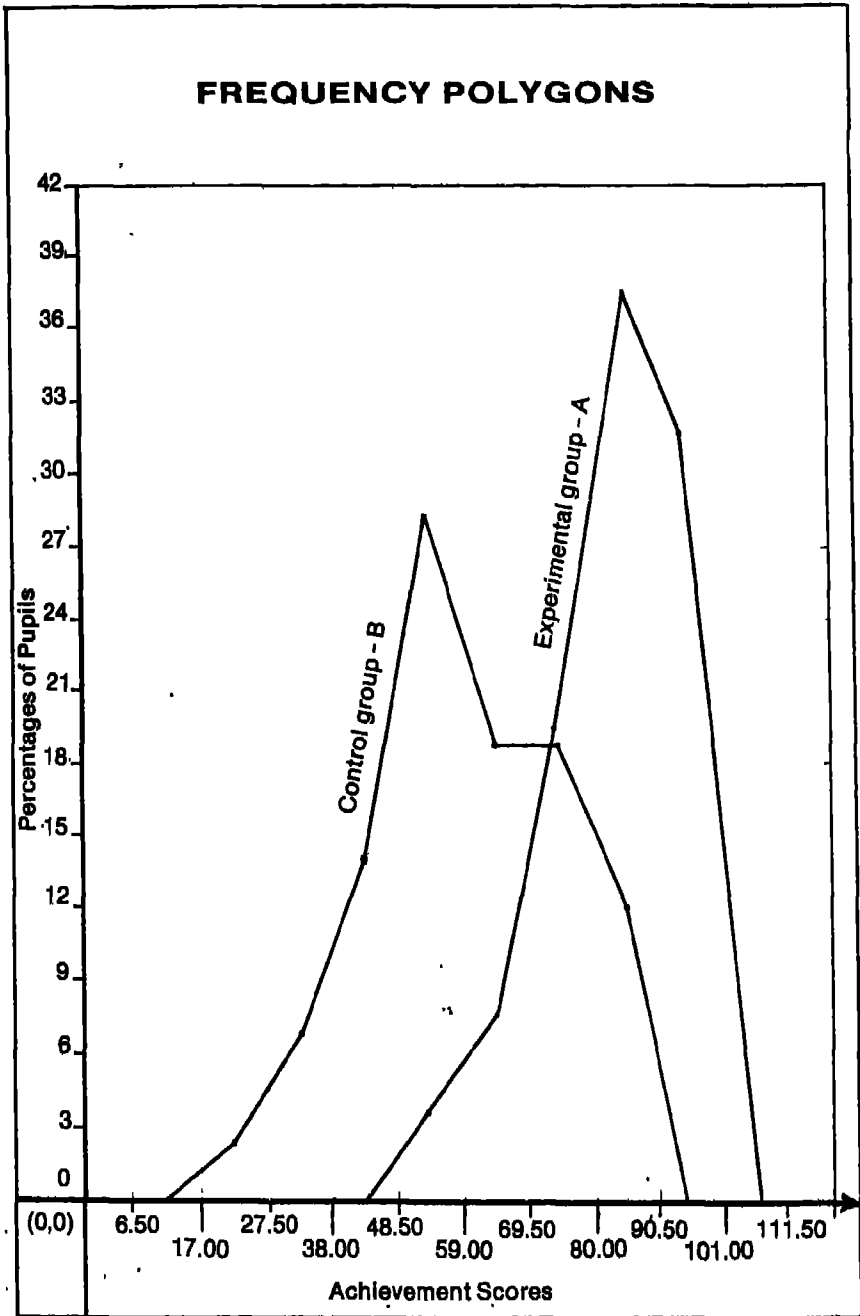
Tryout	Value of Correlation Coefficient 'r'	
	Experimental Group A	Control Group B
Initial	0.634	0.805
Final	0.446	0.620

TABLE 4  
Percentages of Students' Responding Favourably to Different Queries of the Questionnaire

Queries	Percentages of Students giving Favourable Responses
— Going for private tuitions	23.81
— Doing homework mostly alone	66.67
— Liking all the concepts and chapters of the geometry course	73.81
— Equally liking all the three components: the game, the discussion and the models preparation	28.57
— Liking the preparation of the models most	57.14
— Liking the discussion most	28.57
— Liking the game most	42.86

TABLE 5  
Frequency Distribution of Pupils of the Experimental and Control Groups in the Final Tryout

Class Intervals of Achievement Scores in the Summative Test	Frequency of Pupils			
	Experimental Group A		Control Group B	
	In Number Out of 51	In Percentage	In Number Out of 43	In Percentage
90.50 - 100	16	31.37	0	0
80.00 - 89.50	19	37.26	5	11.63
69.50 - 79.00	10	19.61	8	18.60
59.00 - 68.50	4	7.84	8	18.60
48.50 - 58.00	2	3.92	12	27.91
38.00 - 47.50	0	0	6	13.95
27.50 - 37.00	0	0	3	6.98
17.00 - 26.50	0	0	1	2.33



## DISCUSSION OF THE RESULTS

The complete course content of fifth-grade geometry was arranged sequentially in three units in logical order of its topics. It was desirable, therefore, that only after most students achieve mastery in a unit that the next unit study begins. The investigator observed that the mastery in earlier units not only facilitated the learning of the subsequent units in a better way but the time needed to achieve mastery over the subsequent units was less than the time required for the first unit for the same purpose—leave aside the enthusiasm and confidence it gave the students for further learning. It was also observed that for learning each unit, the remedials given after the first formative test had positive effect on the achievement scores of the students in the subsequent formative tests. This is evident from Table 1 which also shows that not only the mean value of the scores for the later formative test of each unit is higher than that of the first formative test, but the mean values themselves are very high with increased homogeneity of the group (see standard deviations for Test-2, Unit-1 and for Test-1 on combined Units 2 and 3). It was further observed that the mastery level achievers as well as the distinction and first class scorers in the experimental group of the final tryout were significantly more as compared to the experimental group of the initial tryout—not only at the summative test, but also at the formative tests of each unit. This was due to the impact of the refinement of the mastery learning strategy at the final tryout in view of the better insight into the instructional process and into the interplay of various variables of the mastery learning strategy obtained at the initial tryout.

The percentage scores of the experimental group and the control group at the summative test in Table 2 (final tryout) show that while 68.63 per cent of the pupils of the experimental group achieved the desired mastery level (scoring minimum of 80 per cent of marks), for the pupils of the control group this percentage was only 11.63 (observe the mastery level row in Table 1). The rest 31.37 per cent of the pupils of the experimental group also showed good achievement scores even though they did not achieve mastery. In fact, while for the experimental group 88.24 per cent pupils scored minimum of 70 per cent marks and 96.86 per cent pupils scored minimum of 60 per cent marks, for the pupils of the control group these figures are 30.23 per cent and 48.84 per cent, respectively; moreover, while 30.23 per cent of the pupils of the control group are poor achievers scoring less than 50 per cent marks, in the experimental group no student falls into this category. Thus, the performance of the experimental group was much better than that of the control group. Since the two groups were matched groups for the variable intelligence but were taught by different teacheres using different methods, it seems that the mastery learning strategy developed and used by the investigator during the experiment on Group A worked well and showed better results.

Notice that for the experimental group the mean value of the achievement scores

at the summative test is 82.09 which is above the mastery level, while that for the control group it is as low as 58.95. Moreover, the standard deviation for the experimental group is 10.51 while for the control group it is 15.77—showing that the experimental group was more homogeneous than the control group in their achievement. For the significance of difference between the above two means, one may observe that the *t*-value in Table 1 obtained between the two groups is highly significant at .05 as well as .01 level—thus indicating the greater influence of the developed strategy on the pupils' achievement.

The value of correlation coefficient *r* in Table 3, shows that the dependence of the achievement of pupils on their IQs can be reduced considerably by using the developed strategy, while the same is not true for the control group. In fact, there were several cases wherein the pupils with low IQ could also score higher marks. Of course, the value of *r* for both the groups at the final tryout lies in the range  $\pm .40$  to  $\pm .70$ , showing positive and substantial/marked dependence of the achievement on the variable intelligence; but, for the experimental group it is near the lower limit while for the control group it is near the upper limit.

The frequency polygons, showing the percentage frequencies of the pupils of both the groups in different intervals of achievement scores, depict an intuitively very clear picture of the significantly large difference between the achievement levels of the two groups—in regard to the number of high level score achievers as well as the level of high score itself; as also the mean achievement score. If smoothened, the frequency polygon of the control group will fit very much into the graph of a normal probability curve with low peak located at the score of about 52 per cent only—most students falling between the scores of 38 per cent and 80 per cent and almost half the area under the curve being covered by the score of 50 per cent. On the other hand, if smoothened, the frequency polygon of the experimental group will be very nearer to the graph of the high peaked left skewed curve—left skewness implying more concentration of students towards the high achievement score side (most students scoring above 69.5 per cent) and the high mean achievement score while the high peak of about 85 per cent implying a big lot scoring 85 per cent marks.

The objective of giving a questionnaire to the students was to know the extent to which the pupils appreciated the strategy as a whole and the components of the strategy such as game, discussions and model preparations; as well as to know the effect of certain outside factors such as private tuitions, parents' or friends' help, etc. on the achievement of the pupils. Care was taken to put indirect questions for gathering more information on the developed strategy so as to avoid answers biased in favour of the investigator under the influence of liking they had developed for the investigator during the experiment. It can be seen from their responses (Table 4) that only 23.81 per cent pupils of Group A were going for private tuitions and the investigator observed that just 36 per cent of them could achieve the mastery level. On the other hand, out of the rest 77.19 per cent of

the pupils of Group A who were not going for any private mathematics tuitions, as many as 72 per cent achieved the mastery level. Further, 66.67 per cent of the pupils of Group A did their home work alone and out of them as many as 71.43 per cent had achieved mastery; while from the rest 33.33 per cent of the students taking others' help for doing home work, about 57 per cent of them could achieve mastery. These results show that out side factors of private tuitions and of taking help of others in doing home work had least influence of the achievement scores of the pupils. Table 4 also shows that discussion is the component liked by only few students while the majority of students liked the components of model preparation and game very much—indicating that they liked learning by doing or by task performance activity and learning through fun in the form of mathematical game. It is interesting to note from Table 4 that as many as 73.81 per cent of the pupils liked all concepts and chapters of geometry—indicating that the developed strategy could induce in such a big majority of pupils the liking for the whole of the geometry course; this is indeed very significant because normally every student does develop some dislike for one or the other concept or portion of geometry.

All but two pupils of the experimental group achieved a score of minimum of 65 per cent marks in the summative test. The two lower achievers had scored 53.33 and 50 per cent of marks. The investigator's concern for them finally reveal interesting facts: one was not able to read properly the writing on the blackboard due to some eyesight problem and the other was a thumb-sucker having a feeling of insecurity and lack of confidence. Thus, the mastery learning strategy provides a room for personalized attention to each student's learning problems and adds a personal social aspect to the learning not typical of the group-based instruction. The strategy thus provides a room for care, concern and analysis of the low achievers which, in turn, helps to bring to notice the physical and/or psychological problems of the pupils, if any. Also, out of curiosity to know the change, if any, in the performance in other subjects of some of the pupils of the experimental group, when the investigator informally inquired from some teachers of the other subjects, it was observed that the concerned pupils seemed to be working more later on. It is a strong feeling of the investigator that mastery learning must have made some pupils to realize their potential because to their own surprise they could score very high marks in geometry, which, in turn, might have made them work hard in other subjects too. It is also felt strongly that had these pupils of the experimental group been taught the subsequent geometry course in the following year, again using the mastery learning strategy, the time that would have been needed for the purpose might have been less than the usual, meaning thereby the mastery learning strategy may be helpful in increasing the learning rate of the pupils.

#### EDUCATIONAL IMPLICATIONS

Since the experiment of instruction through the developed strategy was con-



ducted for a group of learners available in a given system, since the experimental and control groups were matched for the variable intelligence and since the same course was taught to both the groups in the same amount of time (five weeks to be precise, with eight periods per week, each period of 35 minutes), the much better performance of the experimental group taught by the investigator through the developed strategy over the control group taught by another teacher indicates that the strategy is worth applying in different schools. Of course, the strategy requires the teacher to work very hard, but it does bring in unexpected and exciting results. The strategy increases the quality of teaching on the part of the teacher and the ability to learn on the part of a student; it helps to remove complexes from the mind of the pupils by building up in them greater self-confidence and also making them realize their potential which, in turn, increases their desire and ability to work continuously.

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## **Educational Backwardness: Developmental Implications with Special Reference to Indian Muslims**

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**E**DUCATION and economic development go hand in hand, even though the casual nexus between the two is not yet undisputably established. The Muslim community in India is known to have lagged behind the rest of the society in educational progress during the past several decades. A major culprit for the relative backwardness of the Muslims during the colonial period was allegedly the British policy of antagonising and suppressing Muslim interests in India. The post-colonial period has witnessed rapid progress in the educational status of the different regions, communities and economic groups. However, the rates of progress achieved do not seem to have been uniform among these various groups. The earlier disparities still persist. One of the affected sections of society is the Muslim community, which is by far the largest minority group in India accounting for about 12 per cent of India's total population. Even in Kerala which has entrenched itself among the rest of the states in India in respect of literacy levels, the

Muslims seem to have remained educationally backward. Moreover, the relative educational backwardness of the community seems to be intimately related to its backwardness in social and economic status as well. The factors which account for such backwardness are not obvious. It is, therefore, timely and appropriate that the extent of such backwardness, the factors which account for it, and its impact and implications for the development strategy of the state are systematically analysed. It is with this purpose that the present exercise is undertaken. Before we take up the analysis, it would be in order to trace briefly the educational and socio-economic conditions of the Muslim community in India in general as revealed by a few studies already made on the subject.

K.D. Sharma's study based on field data from Delhi, postulates two hypotheses:

- (i) The higher the stage of education, the lesser is the participation of the Muslims;
- (ii) The social and economic conditions of the Muslim community tend to restrict to a greater extent the utilisation of educational opportunities by its members than by the non-Muslims.

Sharma found that the co-efficients of equality at the primary and higher secondary levels for the Muslims were 74.0 and 23.6, respectively. This implies the large drop-out rate among them. Long distances between home and school, poor study facilities at home, non-availability of institutions in their mother tongue, etc. are the discouraging educational factors identified by the author. Socio-cultural taboos also affect the Muslims' enrolment in educational institutions. They include : (a) the belief that there is in existence a concerted attempt by the government to impose upon the Muslims the majority culture through educational programmes offered; (b) the feeling against the prevailing bias against Urdu, and (c) high cost of schooling and high rates of unemployment among the educated youths. According to Sharma, the most important factor for the educational and economic backwardness of the Muslims was the absence of a middle class leadership which functions as a link between the upper and the lower strata of the community. He suggests that the inclusion of religious teachings in the curriculum would pave the way for active participation in education activities by the Muslim community.

A.R. Kamat's opinion that, in the past, the Indian Muslim population was socially and economically backward does not convincingly explain the Muslims' relative backwardness in education. In socio-economic terms, the Muslims are not better or worse than others, whether in the middle, lower middle or backward categories. More than socio-economic questions, the question of language is more important. For instance, in speaking about the educational cultural predicament of the Muslim community in India, the question of Urdu comes up time and again. According to the 1971 census, there were 28.6 million persons in India who spoke Urdu in their homes, i.e., 5.18 per cent of the total population. It must be

recognised that because its script contains several words of Parso-Arabic (the language of the Holy Quran) origin, and also because it is historically associated with the erstwhile Muslim rule, Urdu has acquired a religious-cum-political significance in the minds of many influential sections of the Indian Muslim population.

It is against this background that we may now look at literacy and education among the Muslims during the post-1947 period. In the absence of reliable data, we have to rely mostly on guess estimates made by various researchers. According to one source quoted by A.B. Shah (attributed to Basheer Ahmed Syed, a former Judge of the Madras High Court), the literacy level for the Muslims in 1971 was 10.0 per cent for males and 0.5 per cent for females. Obviously, these figures are incredibly low. Yogendra Singh (quoting Theodore P. Wright) puts the literacy level of the Muslims for the mid-1960's at about 28 per cent.

A few micro-studies which have examined the educational status of the Muslims also exist. The Delhi Survey (of 1971-72) states that the percentage of enrolment to population in the relevant age-groups in the surveyed areas of the city were 6.20 per cent and 11.24 per cent for the Muslims and the non-Muslims, respectively, at the primary school level; and 2.59 per cent and 11.28 per cent, respectively, at the middle school and secondary school levels. Rasheeduddin Khan asserts (from the proportion of passes in the U.P. High School Board Examination) that the Muslim boys were five times, and the Muslim girls eleven times, more backward than the rest.

In his study of the Muslims in Bhiwandi, an industrial township situated 31 miles from Bombay, A.R. Monsur notes that in the early seventies, enrolment of the Muslims in Bhiwandi college was only 30 per cent as against their strength of 60 per cent in the town's population. A similar wide gap was seen in performance also as between the Hindu and the Muslim students in that college. Interestingly, differences existed among the different groups of the Muslims themselves, for instance, the Konkani Muslims (almost one-quarter of the total Muslim's population of the town) were found to be much more advanced educationally than the other Muslims, a weaker sect, who had migrated to this region from the more northern parts of the country during the late 19th century. In another study of a township in Western U.P. included in the same volume, S.P. Jain found, on the basis of a sample investigation of 155 Muslim adults, that the overall literacy level was 15 per cent and that it varied from 24 per cent to zero per cent from the upper to the lower-Muslim castes. Kamat's investigation in rural areas of Maharashtra for the period 1955-65 places the Muslims near about or between the Maratha Caste cluster and the Artisan Caste cluster. These micro studies do suggest interesting propositions for further enquiry. However, they do not serve to convey meaningful insights into the evolution of the Muslim's educational status in its proper historical perspective. An enquiry into the historical processes might unravel

different facets beginning from that of the influential Muslim intelligentsia of the pre-British period to the trauma of the early British period, the subsequent awakening and resurgence of the Indian society in general and its various segments including the events which led to the partitioning of the country and the consequent Muslims exodus to Pakistan and finally to the post-1947 period.

Apart from the historical processes, another significant fact to note in the analysis of any stratum of the Indian society is the heterogeneity which exists within it. Just like any other segment of the Indian society, the Muslims also comprise heterogeneous socio-economic groups. It is, therefore, necessary to go into their caste-like formations, income, occupational and property-base structure in detail if valid conclusions are to be arrived at.

There exists clear evidence to suggest that the Muslims are under-represented in the public sector services in India, a fact which may be taken as reflection of their relative educational backwardness.

TABLE 1  
Some Indicators of Muslim Presence in Government Service

Name of Service	Years/No. of establishment	Total No.	Muslims	Muslims as % to the total
IAS	Total in 1981	3883	116	2.99
IPS	Total in 1981	1753	50	2.85
Income Tax	Intake during 1971-80	881	27	3.06
Railway, Traffic and A/c Service	Intake during 1971-80	415	11	2.65
Banks	1317 Branches	113772	2479	2.18
Central Government	105 Offices in 13 States	75951	3346	4.41
State Government Offices	876 Offices in 13 States	826669	49718	6.01
Public Sector Undertakings	168 Undertakings	476972	51755	10.85

Source: *Muslim India*, Journal, New Delhi, December, 1983, p.552.

It is obvious that the Muslims' share in Government service is less than proportionate to their share in the total population. In the Central Government and State Government services, the Muslims account for only 4.41 per cent and 6.01 per cent, respectively. It is much less in other sectors like Banks, Railways, Income Tax Department, etc. Their representation in banking services is the lowest, 2.65 per cent, perhaps due also to their reluctance to take up work in this sector in the belief that banking involves interest payments, a practice which Quran has strongly deprecated. According to data available up to 1971, there are 116 Muslims out of a total 3883 working in the IAS cadre and 50 out of 1753 in the IPS

cadre, i.e. a meagre percentage of 2.99 and 2.85, respectively. The situation is definitely better in lower status jobs, namely, Class III and Class IV categories' (see Table 2).

TABLE 2  
Muslims' Representation in Class III and Class IV Categories, 1981

Category	Class III			Class IV		
	Total	Muslims	% to Total	Total	Muslims	% to Total
Banks	61151	1295	2.12	26305	587	2.13
Central Government	52000	2294	4.14	17669	904	5.12
State Government	598327	32032	6.43	226558	14381	6.35
Public Sector Undertakings	220235	26745	12.14	229129	23970	10.46
Private Sector Undertakings	50464	4180	8.28	66796	5297	7.93

Source : Same as for Table 1

In the public sector undertakings the Muslims are adequately represented, i.e. by about 12.14 per cent in Class III and 10.46 per cent in Class IV. The level of the community's representation seems to have deteriorated since 1971. In 1981 the Muslims' representation in Class I/Executive Cadre in Central and State Governments and Public Sector undertakings was just 1.61, 3.30 and 3.19 per cent, respectively. Similarly, in Class II (Technical Cadre) their corresponding shares were 3.00, 4.48 and 4.30 per cent, respectively. Thus it is obvious that in the higher employment categories, the Muslims are under-represented while in the lower categories, they are represented more adequately. One of the reasons for such inter-category differences in representation could be the fact that they are more backward educationally with regard to higher qualifications.

In this case study of the Muslim community in Malappuram district in Kerala, P.M. Jaleel examines the question of the education-economic nexus. His study is based on the results of a survey he conducted of 12000 households. The main hypothesis he postulates is that significant differences would exist between the more educated and the less educated in regard to their economic achievement measured in terms of income, saving and employment and indicators such as productivity in agriculture, and participation in community development programmes. Jaleel has observed that in Malappuram district, the overall literacy increased from 34.29 per cent in 1961 to 59.01 per cent in 1981, the number of high schools increased by 112.90 per cent during the same period. He attempts to relate these observed improvements in education and education infrastructure to income growth for households in the district. The conclusions which he draws are not definitive since income levels and rates of economic growth as represented by domestic product figures (which the author has used) do not show that the performance of

the Malappuram district was any better than the rest of districts in Kerala. In fact, Malappuram has remained at the bottom in the list of districts ranked according to per capita domestic product. It is more likely that the educational improvement observed was spurred by inflow of remittances to households from abroad which do not get accounted for in domestic product figures.

Jaleel's study at best only suggests a causal connection between economic and educational change. A more indepth enquiry is required to verify the hypothesis. Similar shortcomings are noticed in other studies also. Shahul Hameed, for example, finds that the majority of his respondents (all Muslims) had incomes below Rs.500 per month and that their living conditions were poor. The educational achievements of the respondents and their wards remain extremely low and backwardness is transmitted from generation to generation. Educational and economic backwardness seriously limit their spatial and occupational mobility and ties them down to traditional, low income activities such as fishing, petty trade, etc.

Indu Menon refers to the important role of education in the promotion of the socio-economic status of Muslim women in Kerala. She finds that social evils such as polygamy and divorce, prevalent in the Muslim community, are due to low educational status.

#### EDUCATIONAL AND ECONOMIC STATUS OF THE MUSLIM COMMUNITY—AN INTER-DISTRICT COMPARISON

The preceding review has thus suggested that even in Kerala, the Muslim community remains both educationally and economically backward. However, the extent of the consequences of educational backwardness on the socio-economic conditions of the Muslims in India is not yet clear. For this purpose, we depend on a household survey conducted in five districts of Kerala state. The stratified non-random sampling method was followed for the survey. Districts with high and with low literacy rates were chosen. According to the 1981 census, Ernakulam, Quilon, Trichur and Alleppy were the high literacy districts, and Palghat was a typically low literacy district (Table 3).

The size of the sample was 200 Muslim households spread over these five districts (in Quilon, Ernakulam and Palghat 40 households each; 37 households in Alleppey and 43 in Trichur). The total number of members of the households came to 1320; 660 were males and 660 females. Table 4 shows their distribution according to age-group. The majority (61 per cent) fall in the age-group of 15-54. Three hundred and forty-four members (185 girls and 155 boys) were of the school-going age of 5-14 year. The others were either children below five years (69) or old people above 55 years (104).

TABLE 3  
Literacy Rate in the Five Districts, 1981

Panchayats/ Districts	No. of Literates			Literates as % to Total Population			% of Muslim Population (according to 1971 Census)
	Total	Males	Females	Total	Males	Females	
Mukhathala							
Quilon	157324	83839	73485	71.47	76.41	66.55	16.21
Kanjikkuzhi							
Alleppey	104974	54849	50125	78.64	83.20	71.20	16.18
Edappally							
Ernakulam	84614	45707	38907	74.12	78.69	69.39	13.32
Vengallur							
Trichur	72763	35587	37176	75.06	78.78	71.81	6.3
Chittur							
Palghat	61811	37089	24722	46.77	56.71	37.03	11.63

Source: i) Census Report, Kerala Paper 3 of 1981  
ii) Kerala Social and Cultural Tables, Part II-C (i), 1971

#### (i) Educational Status

The distribution of the members of the sample households, according to educational level, is shown in Table 5. Of the total, nearly 20.52 per cent are illiterate, 28.10 per cent have education up to Standard IV, 7.72 per cent are SSLC and 1.19 per cent are PUC passed. There are only 0.48 per cent graduates among them and no post-graduates at all. There are no engineering or medical graduates either. Technical education among them is confined to six ITC holders, one B.Ed. holder, five GTE certificate holders, five TC holders and two Afzalul-Ulumn certificate holders. The sex-wise analysis of the data shows that females lag far behind males in the matter of both general and technical education. While illiterates are only 11.96 per cent among males, they form 28.60 per cent among females. Similarly, the percentage of males to the total population with education up to Standard IV is 30.86 while it is only 25.70 among females. In the matter of higher education also the picture is not different. Out of 97 SSLC holders, 61 are males and 36 females; out of six graduates, four are males and two females. And all the six ITC holders are males. The professional preference of the women is reflected in the data, i.e. out of five ITC holders, three are females, and the only B.Ed. graduate is female.

Palghat is the most educationally backward of these five districts, with 49.62 per cent illiteracy rate. Illiteracy is smaller in other districts (Trichur 8.39 per cent, Ernakulam 16.74 per cent, Alleppey 13.40 per cent and Quilon 13.28 per cent). Similarly, at every level of education Palghat is backward. Alleppey and Quilon stand much ahead of other districts. We classify the districts into three groups



TABLE 4  
Distribution of Members of the Sample Households According to Age-group

Age Group	Quilon			Alleppey			Emakulam			Anichur			Palghat			% to Total	
	M	F	T	M	F	T	M	F	T	M	F	T	M	F	T	Total	
0-4	5	6	11	6	5	11	7	7	14	15	3	18	11	4	15	69	5.23
5-14	37	47	84	26	29	55	28	24	52	36	34	70	28	55	83	344	26.06
15-24	35	31	66	39	30	69	40	29	69	29	48	77	29	42	71	352	26.67
25-54	49	50	99	50	38	88	42	35	77	54	46	100	40	47	87	451	34.17
55 and above	10	10	20	9	10	19	12	13	25	10	7	17	10	13	23	104	7.87
	136	144	280	130	132	262	129	108	237	144	138	282	118	161	299	1320	100.00

Source : Field Survey Data

Note : M: Male; F: Female; T: Total

TABLE 5  
Percentage Distribution of the Members of the Sample Households According to the Educational Level, District-wise

Educational Level	The Percentage of Response to the Total				Quilon				Alleppey			
	M	F	T		M	F	T		M	F	T	
i) Illiterate	11.96	28.6	20.52		9.38	16.68	13.28		3.15	25.0	13.39	
ii) Primary (up to IV)	30.86	25.70	28.14		25.78	31.08	28.42		26.77	17.86	22.59	
iii) Secondary (IV-VII)	25.56	19.60	22.51		23.44	19.48	21.40		23.62	18.75	21.34	
iv) High School	18.52	17.46	18.00		28.90	25.07	26.94		18.90	22.32	20.50	
v) SSLC Passed	10.00	5.56	7.72		9.38	6.29	7.75		17.32	8.93	13.39	
vi) PUC Passed	1.15	1.24	1.19		.78	.70	.74		3.15	2.68	2.93	
vii) BA/B.Sc/B.Com	0.65	0.31	0.48		1.56	-	.74		1.57	.89	1.26	
viii) MA/M.Sc/M.Com	-	-	-		-	-	-		-	-	-	
ix) Engineering Graduates/Diploma-holders, etc.	-	-	-		-	-	-		-	-	-	
x) Medical Graduates/Others	-	-	-		-	-	-		-	-	-	
xi) III/IIC	0.98	-	0.48		0.78	-	0.37		3.94	-	2.09	
xii) B.Ed/M.Ed.	-	0.15	0.08		-	-	-		-	-	-	
xiii) KGTE	-	0.61	0.32		-	-	-		-	2.68	1.26	
xiv) TTC	0.16	0.62	0.40		-	0.70	0.36		0.79	0.89	0.84	
xv) Agricultural	0.16	0.15	0.16		-	-	-		0.79	-	0.42	
Total	100.00	100.00	100.00		100.00	100.00	100.00		100.00	100.00	100.00	

Table No 5 : Contd.

Educational Level	Ernakulam			Trichur			Palghat		
	M	F	T	M	F	T	M	F	T
i) Illiterate	12.30	22.22	16.74	2.38	13.97	8.40	36.45	58.59	49.62
ii) Primary (up to IV)	36.07	37.37	36.65	37.30	22.06	29.39	27.10	22.94	24.62
iii) Secondary (IV-VII)	25.40	19.19	22.62	30.16	29.41	29.77	25.24	12.10	17.42
iv) High School	18.93	15.15	14.48	22.23	23.53	22.90	6.54	3.18	4.55
v) SSLC Passed	10.66	4.04	7.68	7.14	6.60	6.87	4.67	2.55	3.41
vi) PUC Passed	.82	1.01	.90	.79	2.21	1.53	-	-	-
vii) BA/B.Sc/B.Com.	-	-	-	-	0.74	0.33	-	-	-
viii) MA/M.Sc/M.Com.	-	-	-	-	-	-	-	-	-
ix) Engineering Graduates/Diploma-holders, etc.	-	-	-	-	-	-	-	-	-
x) Medical Graduates/Other	-	-	-	-	-	-	-	-	-
xi) ITI/IIC	-	-	-	-	-	-	-	-	-
xii) B.Ed/M.Ed.	-	-	-	-	0.74	0.38	-	-	-
xiii) KGTE	0.82	-	0.48	-	-	-	-	-	-
xiv) TTC	-	-	-	-	0.74	0.38	-	0.64	0.38
xv) Agricultural	-	1.02	0.45	-	-	-	-	-	-
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

in terms of educational status: high, medium and low. In all the five districts, irrespective of their overall educational status, the educational level of the Muslim community remains lower than the respective district averages.

(ii) *Occupational Status*

The effect of the educational backwardness of the Muslims on their economic status may now be examined (Table 6). The percentage of persons employed in government is nearly 1 and 0.37 per cent in the NGO (non-menial) category and 0.68 per cent in the lower grade categories. The common activities of the majority in the sample are self-employment (4.05 per cent), petty trading (6.59 per cent), non-agricultural manual labour (8.10 per cent), and agricultural labour (0.98 per cent). Unemployment comes to 12.87 per cent, which includes the educated, the unskilled and the little educated. The proportion of students to the total is 26.97. Their unorganised and low level activity status obviously is the result of low educational attainment. The sex-wise break-up shows that the majority of females are either housewives or students (i.e. 62.27 per cent and 24.70 per cent, respectively). The rest of the workers are engaged in low-level economic activities such as agricultural labourers.

The district-wise analysis of the data clearly shows that more the proportion of the educated, the higher is the participation rate in the government sector.

TABLE 6  
Percentage Distribution of Sample Population by the Age-group According to Activity Status

Activity	M	F	Total
Unemployed	24.54	1.21	12.87
Non-Gazetted Officers	0.60	0.15	0.37
Lower Grade	1.21	0.15	0.68
Students	28.93	24.70	26.97
Self-employed	7.58	0.35	4.05
Small Traders	12.72	0.45	6.59
Medium Traders	1.51	—	0.76
Coolies	11.81	4.39	8.10
Agricultural Labourers	1.66	0.30	0.98
Households	—	62.27	31.14
Infants	6.82	4.10	5.45
Old Age	2.62	1.93	2.04
Total	100.00	100.00	100.00

For example, the percentage of the respondents who are non-gazetted officers in the high literacy districts (Alleppey and Quilon), is 0.57 and in the medium literacy district (Trichur and Ernakulam) 0.38. However, there is no NGO in the very low literacy district of Palghat. In the case of LG category also the percentage

TABLE 7  
Percentage Distribution of Respondents According to Activity Status (Category-wise)

Activity	High Literacy Districts			Medium Literacy Districts			Very Low Literacy Districts		
	M	F	T	M	F	T	M	F	T
Unemployed	33.08	1.95	17.81	13.19	1.21	7.51	32.23	0	13.62
NGO	.75	.39	.57	.73	-	.38	-	-	-
LG	1.13	-	.57	1.83	.40	1.16	-	-	-
Students	30.75	29.18	29.88	32.20	25.66	28.64	22.03	16.14	18.63
Self-employed	5.64	-	2.87	6.27	.40	3.47	15.25	1.24	7.07
Small Traders	16.54	-	8.43	12.45	-	6.55	5.08	1.86	3.02
Muslim Traders	.37	-	.19	3.30	-	1.73	-	-	-
Coolies	6.02	-	3.06	16.12	3.65	10.21	15.25	12.42	13.62
Agricultural Labourers	-	-	-	3.29	.81	2.12	1.69	-	.72
Households	-	62.04	30.21	-	60.56	28.71	-	63.37	36.91
Infants	4.22	5.08	4.88	6.96	4.47	5.78	8.57	3.73	5.70
Old Age	1.50	1.36	1.53	3.66	2.84	3.67	-	1.24	0.71
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

of the respondents is zero in this district, whereas it is 0.57 per cent and 1.16 per cent in the first and the second category districts. The main economic activities in the Palghat district are Coolies (13.62 per cent). Agricultural labourers (0.72 per cent) and self-employed (7.07 per cent). But in the first and the second category districts, the majority of the respondents are either traders or self-employed. The unemployment rate in the first category district is very high, i.e. 17.81 per cent reflecting the general prevalence of educated unemployed in Kerala. It is found that the major share of the unemployed in the sample districts have education up to SSLC and above. The population in the working age in the high literacy and medium literacy districts is thus seen to be economically better off than their counterparts in the low literacy district. Moreover, it is observed that compared to men, women seldom participate in economic activities outside their households. In trading and in government sector their participation is negligible. If at all they are employed outside their homes (as in the case of the Palghat district) it is in poverty-induced, low-income activities.

(iii) *The Income Level of the Households*

We have already found that in the high literacy and medium literacy districts participation in economically productive activities is higher than in the low literacy district. The distribution of households in the sample districts by levels of household income is shown in Table 8.

TABLE 8  
Distribution of Households According to Monthly Income

Income Levels	District					Total
	Quilon	Alleppey	Ernakulam	Trichur	Palghat	
0-249	26	26	11	17	37	118
250-499	6	5	9	18	3	41
500-999	4	3	5	8	—	20
1000-1999	2	2	14	—	—	17
2000 and Above	2	1	1	—	—	4
Total	40	37	40	43	40	200

In the low literacy district of Palghat, 37 out of 40 households (92.5 per cent) have only a monthly income of less than Rs 250 as against 50 per cent in the high literacy districts, while no household in Palghat has a monthly income of Rs 500 or more, the proportion of such households in the other districts comes to 26.25 per cent. Therefore, the educational and income status of the households go hand in hand, probably reinforcing mutually. In general, the finding that emerges from the preceding discussion is one of general economic and educational back-

wardness of the Muslim community both in the more advanced and the backward districts. We shall now verify this tentative finding in terms of the asset position of the households. The predominant asset of the households, which are almost entirely rural, is land.

*(iv) Ownership of Landholdings*

The district-wise distribution of landholdings shows that in the low literacy district of Palghat, 27 of the households have only five cents or less of land; and seven households do not have any land of their own at all. On the other hand, in the other districts (in which the literacy rate is higher) there are no landless

TABLE 9  
Distribution of Households According to Landholdings (In cents)

Size of Holding in (cents)	District					Total
	Quilon	Alleppey	Ernakulam	Trichur	Palghat	
—	—	—	—	—	7	7
0-5	12	6	3	3	27	51
6-10	15	11	5	4	3	38
11-20	9	9	3	13	2	36
21-50	2	5	14	13	—	34
51 and Above	2	6	15	10	1	34
Total	40	37	40	43	40	200

households. The majority of the households in these districts have 11 cents or more of land. The figures in Table 9 suggest that a positive correlation exists between educational level and land ownership.

*(v) Housing Patterns*

Apart from landholdings, the housing pattern also in an indicator of economic status. Table 10 shows that the largest proportion of houses (57.5 per cent) in the Palghat district are either huts or thatched structures. Moreover, in this low literacy district, there are no households with concrete or double-storeyed buildings, a fact which reflects the economic backwardness of the community.

In contrast, in the other higher literacy districts, the majority (86.38 per cent) of the houses are tiled or concrete.

*(vi) Marital Status*

The proportion of the unmarried women (above 18 years of age) is also found

TABLE 10  
Distribution of Households According to Housing Pattern Distribution

Housing Pattern	District					Total
	Quilon	Alleppey	Emakulam	Trichur	Palghat	
Huts	7	3	—	5	10	25
Tiled	20	24	34	23	17	118
Thatched	6	8	1	12	13	40
Concrete	7	2	5	2	—	16
Double-storeyed	—	—	—	1	—	1
Total	40	37	40	43	40	200

to be higher in the Palghat district. Naturally, therefore, the proportion of bachelors (25 years and above) is also higher in this district. The high proportions observed reflect the fact that economic backwardness is a hindrance to marriage. However, the welcome aspect of this finding is that marital alliances are not ventured into by the economically backward persons (particularly among men, who are the active partners in marriages). In tradition-bound societies, marriages are observed to take place, irrespective of this economic status of the partners, as a social and moral obligation to be fulfilled. In the other districts, the corresponding proportions are much lower. Another welcome feature observed is the virtual disappearance of child marriages. This indicates the growing awareness among the Muslims about the undesirability of child marriage. Divorce and the practice of polygamy supposed to exist among the Muslims were also found to be absent in our sample households, except for a solitary case (of polygamy) reported from the Quilon district. Thus we find that in spite of the existence of wide-ranging economic and educational inequalities, social evils like polygamy and divorce have almost entirely disappeared from the Muslim community, due probably to the currents of social progress flowing across the society through all communities.

#### (vii) Assistance Received

The distribution of the sample households according to the type of socio-economic assistance received from governmental agencies is shown in Table 12. Only 11 per cent of the households have received any assistance; of those which received it, the majority (14 out of 22) were recipients of pensions or unemployment allowances, not any assistance for production purposes. For instance, the number of households which received assistance from IRDP or other self-employment programmes constituted only 8. Besides, it is observed that pensions and allowances do not reach all those who are eligible for them due mostly to ignorance. For example, even though there are 104 aged (old) persons above 55 years of age, only one person is receiving old-age pension.



TABLE 11  
Distribution of Respondents According to Marital Status (District-wise)

	Married			Unmarried			Divorced			Widowed			Polygamy			Total	
	M	F	T	M	F	T	M	F	T	M	F	T	M	F	T		
Quilon	58	64	122	77	67	144	-	-	-	-	11	11	1	-	-	1	278
Alleppey	55	50	105	76	57	133	-	-	-	-	6	6	-	-	-	-	244
Ernakulam	58	55	113	72	40	112	-	-	-	2	10	12	-	-	-	-	237
Trichur	60	66	126	82	68	150	-	-	-	1	6	7	-	-	-	-	283
Palghat	45	48	93	72	97	169	-	-	-	1	15	16	-	-	-	-	278
Total	276	283	559	379	329	708	-	-	-	4	48	52	1	-	-	1	1320

TABLE 12  
Distribution of Households According to Assistance Received

Districts	IRDP and Other Self- employment Scheme	Type of Assistance				Household which have Received no Assistance	Total
		Unemploy- ment Role	Agri. Pension	Old Age Pension	Widow Pension		
Quilon	1	2	-	-	1	36	40
Alleppey	2	2	-	-	-	33	37
Emakulam	-	-	-	-	-	39	40
Tiruchur	3	-	1	1	-	37	43
Palghat	2	-	3	-	1	33	40
Total	8	4	4	1	2	178	200

In general, the finding that emerges from the preceding discussion is one of general economic and educational backwardness of the Muslim community both in the more advanced and the backward districts. The little progress in the matter of income, occupation, landholding, housing construction, marital status, etc. is recorded in those districts which have comparatively higher literacy levels. This suggests a somewhat positive association between the educational level and the socio-economic advancement. Thus, it is high time that the policy-makers and government agencies made an all-out effort to promote the educational standards of the Muslim community which forms a huge segment of the population.

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## Testing Reading Comprehension : A Comparative Analysis of Cloze Test and Multiple Choice Test

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**R**EADING, as we interpret it, is a complex physio-psychological process involving a series of activities. We may read a word, a sentence, a paragraph, an episode, a feature, a story, and so on. In the case of a word only, one perceives the visual code of the phonic structure of the word by his optic mechanism and instantaneously arrives at its phonic form (which he may produce loudly or not) to get the idea contained in it or associated with it. If the word is within his sight vocabulary and reading vocabulary as well, the links between the aforesaid actions are established so swiftly that the moment one "sees" a word or sets his vision on it, he decodes the 'meaning' or the 'message' out of it. This activity presupposes letter-recognition, discrimination and word-recognition ability on the part of the reader.

In the case of a Sentence, the reader discriminates, recognizes and perceives the words and what more, at each pause, recognizes a group of words as working

units by their general form and striking features and he proceeds as rapidly along the lines as he can grasp the meaning. He may not decode the visual cues of the words in a Sentence, he may anticipate the meaning and jump over some words or phrases and pass on the next sentence by ascertaining the meaning of the previous part and associating it with that of the later.

Thus reading consists of the following sub-skills :

1. Word-recognition and perception.
2. Recognition of intra-sentence-word-order.
3. Identification of the anticipated semantic structures of the groups of words, sentences and clusters of sentences.
4. Selection of the fitting ones according to the context of the material read.

## READING COMPREHENSION

Reading comprehension is a process by which a reader comprehends the matter, the message or the idea contained in the text through reading; a serial-cum-pendular process of word-recognition, word-discrimination, word-perception, perception of intra-sentence-word-order and understanding of the role of each word in a sentence so far as the structure and function of the sentence is concerned. The semantic frame of the text may be multi-dimensional; it may demand comprehension in the first level which may lead to a search for implied meanings through critical analysis of the morphological structures and thereby criticism and adoption of identical semantic structures in the second level, and getting feedback from the comprehended message, one may probe further into the structures, morphological and semantic for literary appreciation. Reading comprehension is the search for first level message which is clearly given with the morphological structure of the text. Perception of the every next word, next phrase and next sentence gives and feedback to the comprehension of the previous ones and thereby the reader comprehends the message in its totality.

## TESTING READING COMPREHENSION

Reading comprehension can be tested in various ways. The traditional type of testing a reader's comprehension is to give him a message to read orally or silently and then ask him to write answers to some questions set from the passage at random. Here, with a view to assessing comprehension, we assess some other things also which are beyond our objectives. Whenever a student comprehends something, it is his receptive ability that counts, when he is asked to write something out of the matter comprehended we stress upon his production ability also. The less

we demand production on the part of the student, i.e. expression of the idea, meaning or message in his own sentences, the more we do justice to the fact that we are going to assess his reading comprehension. Hence the search for alternatives to the traditional "read and say" or "read and write" testing.

### 1. Objective Type Test

In objective type tests we can minimise the error of using such non-valid measures of testing comprehension. Multiple choice test can assess one's comprehension demanding recognition and selection of the most relevant response from a set of multiple responses by marking it with non-linguistic signs such as V-tick, etc. Some questions or incomplete sentences are given in the left, some alternative answers or complements are given respectively on the right side. The questions and the incomplete sentences are such arranged that, if taken as parts, they cover the different aspects or elements dealt with in the reading material. If taken as a whole, they cover the message or the idea, complete in itself, given in the passage.

### 2. Cloze Test

Cloze test is another measure of testing comprehension. To the researchers in the field of language, cloze is becoming a familiar name, a useful test in exploring new horizons of language-testing. Reading comprehension can be measured by it as well. The term 'cloze' is derived from the closure concept of Gestalt psychology. Some items such as words and phrases are deleted from a passage and the reader is asked to go on reading the passage and while reading, to fill up the deletions by the words or items he thinks befitting. To think of the words, the reader must have a grasp on the message given in the discrete sentences as well as on the total message encoded in the paragraph or the passage. Though the responses we want to elicit, are the products of linguistic perception, they do not demand the language production ability from the reader. He only puts words in the deletions which he picks up from his semantic frame which is just being developed in his mind with reference to the given text. Even spelling mistakes are not taken into account in evaluating the responses. The deletions may be at regular intervals to ensure randomness of the deleted elements of sentences, or some particular form of words may be deleted to meet some specific ends. Here, in evaluating comprehension, deletions at regular intervals are more effective according to the researches in the field.

The following are some of the important considerations that should be kept in mind at the time of the construction of a cloze test:

1. The length of the passage should be such that an average student of the class

(for which the test is going to be constructed) can read it silently within half of the time given to him for the total process, i.e. reading, understanding of the message, identification of the deletions, progressive and retroactive reading, and filling in the gaps by accurate words.

2. In selecting the passage, one has to see that the passage contains a complete meaning or message. The message is not dealing with any such specific feature or technical subject which is peculiar to some particular cultural group or social class. In short, the message should be more or less culture-free.

3. Most of the words of the passage are within the range of the students' reading vocabulary.

4. Words to be deleted at regular intervals, i.e. every fifth, seventh or ninth word may be deleted.

5. Only the deleted passage to be given to the students and not the complete one.

6. If there are too deletions, the full marks will be 100, one mark for each accurate word will be allotted.

7. While scoring, one may consider whether only the actual words deleted, or the accurate substitutes having the nearest meaning of the actual, may also be considered.

8. While trying out the passage on a small sample, the possibility of occurrence of substitute words can be examined. If it is found that some substitute words can be applied without hampering the sense of the message, then such accurate substitutes can be taken into account while scoring.

### *3. Multiple Choice Test*

In constructing and administering a multiple choice test, the following considerations may be kept in view :

1. The student will be given time for (a) reading the passage silently, twice or thrice, (b) reading the questions and answers given in a separate sheet, (c) finding out the correct response and marking it by the suggested marker. The respondent will divide the period of time for the aforesaid processes according to his own choice and need.

2. Whether the passage or the reading material will be taken back from the student before going to the question-answer part, or the respondents will be allowed to keep it with him for the whole period, has to be decided according to the objectives defined by the tester. If the questions or items simply demand recall, i.e. some parts of the sentences from the text are simply quoted in the alternate answers, the respondent may pick up the answer from the sentences in the text and give his choice in the text without comprehending the message. In that case, the text should be withdrawn after a certain period of time allotted to him for silent reading of the text, before giving him the question-answer sheet.

3. The text may be kept with the respondent along the whole period if the items are such that the respondent can select the accurate response only when he can comprehend the message. There is little or no chance to recall or to select such responses from the response set as they are written in the original text. The respondent may read the passage, whenever needed, to choose the correct responses for the given statements or questions or sub-sentences.

4. The questions or the sub-sentences for which complements are wanted, are to be structured in such a manner that the individual items demand the respondent's comprehension of the parts and thereby making an analytical search for the message and the items, when considered totally, demand a full grasp of the respondent on the message or meaning.

5. The scoring key must be framed previously. The number of items, the weightage on each item and the allotment of time for each item should be pre-fixed.

6. The language of the items, both of the questions and their multiple responses, should be easier to the respondent than that of the text, i.e. the content-words as well as the structure-words of the items should be within the reading vocabulary of the respondent (Content words are generally the nouns and adjectives, structure words are the verbs, suffixes, prefixes, case-endings, etc.). Otherwise they will have to comprehend the text first and then again to comprehend the items along with their responses.

Keeping in mind the aforesaid considerations, an attempt has been made to find out the relation between the achievement of a group of students in reading comprehension measured by cloze test and that of the same group measured by multiple choice test.

### CLOZE TEST

At first, three passages of descriptive and more or less culture-free-content were selected from some textbooks approved for Class VII. Cloze texts were constructed with 7th word deletion, on all the three passages and administered to a group of 40 students. The readability of the texts was estimated with reference to the difficulty level of the passage ascertained by the scores obtained by the group. In passage A, the Mean was 55; in passage B, it was 67; and in passage C, it was 48. Passage B was selected. All the passages had 100 deletions. It was found that some students could not cover the whole passage in one period (of 40 minutes), i.e. they could not approach the last few lines. So, instead of 100 deletions, the passage was retained up to 70 deletions. The first seven sentences remained undeleted for the convenience of the reader and for an easy start.

#### *Physical Dimension of a Passage*

A passage is a part of a story, yet it carries a complete meaning and is not loaded



with so many proper nouns. Some proper nouns and some specific content-words are there also, but they can easily be substituted by similar synonyms without affecting the story and its comprehension at all.

The passage contains 40 sentences and 532 words.

### *Administration of the Cloze Test*

The students of Class VII of West Bengal constituted the population of the study.

### *Sampling Frame*

Twelve secondary schools were selected from three districts of West Bengal, i.e. Burdwan, Birbhum and Bankura. Among these, four urban, four rural and other four were rural-urban co-educational. Among the four urban, two were boys' and two girls' schools and among the four rural schools, two were boys' and two were girls' schools.

The samples were classified, first, into two groups, boys and girls for comparing their performance in cloze test, and then into rural and urban groups for comparing their performance in the same.

A. Total No. of Students :	Urban	225
	Rural	<u>286</u>
	Total	511
B. Total No. of Students :	Boys	246
	Girls	<u>265</u>
	Total	511

### *Scoring Scheme*

Seventy deletions were there in the passage, and it was decided that the actual words deleted as well as the accurate substitutes of the actual words were to be given equal credit. By accurate substitutes, the following were meant :

1. The nearest synonym given in the dictionaries.
2. Words though not being accepted as synonyms, fit contextually well in the sentence-frame or the phrase-frame.
3. Structure-words or such other sentence components, having little or no relation with the actual words, when they are taken separately from the text, but seem not at all misfit when considered in the passage or sentence.
4. Colloquial or dialectical words also to be taken into account.
5. Spelling mistakes not to be considered as wrong responses.

### *Time Given*

A period of 40 minutes was allotted for administering the test, five minutes for

instruction and 35 minutes for reading and filling in the deletions.

### Instruction

Instructions were written at the top of the passage, which run like this—"Here is a passage. Read it carefully. It is a story. The first few sentences of the story are complete. After a few sentences you will find gaps at regular intervals. While reading, you are to write appropriate words in the gaps. Select such words which match well in the sentence". These instructions were also read out to the class. The investigator or the tester would see that nobody must copy others' response.

### Hypotheses

The following hypotheses were framed :

1. There is no significant difference between the performance of boys and girls in the cloze test.
2. There is no significant difference between the performance of urban and rural groups.

### Consequences

1. The CR of the two sets of data will not be significant at .05 or at .01 level.
2. Here also the CR of the two sets of data will not be significant at .05 level or at .01 level

### Findings

A.	The mean of the boys' group	:	53.75
	The $\sigma$ of the boys' group	:	10.35
	The M of the girls' group	:	53.22
	The $\sigma$ of the girls' group	:	10.21
	$6 D$ (St. error of difference) = .919		

$$CR = \frac{M_1 - M_2}{6 D} = \frac{.5}{.919} = .54$$

(not significant at .05 level)

B.	The mean of the urban group	:	55.00
	The mean the rural group	:	53.99
	The $\sigma$ of the urban group	:	9.98
	The $\sigma$ of the rural group	:	10.48
	$6 D = .909$		

C.R. = 1-1 not significant at .05 level.

So null hypotheses 1 and 2 were retained.

An ogive is drawn on the cumulative frequency percentage of the frequencies of the total group of 511 students and from it p 70 is found to be about 70 i.e. 70 per cent of the students scored above 70 per cent in the test concerned. This 70-70 criterion determines the recreational level so far so far as the readability of the passage is concerned (of course, for the said population).

The mean of the total group of 511 students was 53.27 and 6-10.26 and here also the difference between the boys' group and the total group, the girls' group and the total group, the urban group and the total group, the rural group and the total group was not found to be significant at any level of confidence.

## Conclusions

1. This test may be considered as a standardized test of reading comprehension for the students of Class VII.
2. It is, to a large extent, sex-free.
3. It is, to a large extent, free from rural and urban bias.

## MULTIPLE CHOICE TEST

In this phase, first the cloze-test was administered to a sample of 200 students (boys and girls mixed) and their performance was recorded accordingly. Then a multiple choice test for reading comprehension was constructed and administered to the same sample of students.

## Sample

Two hundred students were selected by means of purposive sampling technique from five schools, two from urban setting and three from rural setting. Of these five schools, two were boys' schools, two girls' schools and one co-educational school.

## Construction of a Multiple Choice Test

The passage selected for the cloze test was used in this test also. Two experts on language teaching prepared 20 multiple choice items each and thus 40 items were considered for trying out on 40 students. From the nature of the responses, 26 items were rejected and 14 retained on the basis of the following criteria :

1. Clarity of the language of the statements or questions and of the given responses.
2. Nature of the items presupposing recall/recognition/comprehension.
3. Repetition of the matter dealt with in the items.
4. Coverage and distribution of the items, in the passage.

The total marks allotted for the items were  $14 \times 5 = 70$ , the same as for the cloze test.

### *Scoring Scheme*

There was no scope for an alternate or open response. The responses were structured and accurate responses were prefixed by the experts for each item. There were three responses for each item, of which only one was correct, so far as the semantic frame of the item was concerned.

### *Hypothesis*

There is a relationship between the performance of a group of students in the cloze test and that in the multiple choice test.

### *Consequence*

The coefficient of correlation of the two sets of data will be significant at any level of confidence.

### *Organization of Data and Findings*

Table 1 (From the scores of the cloze test)

M = 200    Mean = 54.65    M = 54.65    FM = 70    SD = 13.26

Table 2 (From the scores of the multiple choice test)

M = 200    Mean = 48.25    FM = 70    SD = 13.26

Table 3 (Co-efficient of correlation between the two sets of scores)

N = 200

$r = .42$  for df 198

$r$  = is significant at .01 level.

Therefore, the hypothesis that there is a relationship between the performance of a group of students in the cloze test and the multiple choice test, is retained.

### *General Observations*

The two aforesaid measures, i.e. the cloze test and the multiple choice test have their own specific merits and limitations.

As far as the multiple choice test is concerned it is not fool proof, but as the students are asked to select correct answers or statements, the approach more or less satisfies the traditional premise that such responses are only possible when comprehension takes place. The cloze procedure, on the other hand, is a new concept and what actually is the mental process by which a student gets involved in filling in the deletions is yet to be explained clearly. When his responses are restricted to the actual words deleted, we demand him to be on the same wavelength as of the writer, at least so far as the thematic map of the passage is concerned.

cerned. When his responses are not restricted to the actual words deleted, we accept accurate substitutes and thereby we give credit to his creative imagination and divergent thinking. We cannot say beyond doubt that we are measuring reading comprehension only and nothing else by the cloze test. However, the study shows that there is a significant relationship between the students' achievement in the multiple choice test and the cloze test. Moreover, the passage is made standardized for the use of the students of Class VII in West Bengal, with Bengali as the Mother Tongue, for assessing their reading comprehension ability.

### *Possibilities of Cloze Procedure*

As revealed by the present study, the cloze procedure has other possibilities also. Substitute words produced by the students are very interesting to study. The vocabulary spectrum of the individual students can be revealed to the teacher. It may be a pleasing reading game ensuring greater involvement of the students in the matter. The substitutes may be of two kinds : (1) accurate substitutes, matching in the contextual and semantic frame, and (2) inaccurate substitutes. When contextually matching responses are considered to be accurate responses, the mismatches are called errors. These errors can and should be analysed. Errors lead us to explore the mental set of the students.

We may ask ourselves several questions like these—

- (a) What psychological rationale was active behind the selection of a particular word?
- (b) What linguistic logic did the students find in selecting a response?
- (c) Why did a particular word seem to him to be a good match in a given set?
- (d) Did his limited vocabulary not permit him to think of a range of words befitting the context given?

The errors committed in the test can be classified according to the following:

- (a) Socio-linguistic exposures of some of the respondents particularly belonging to illiterate or barely literate families are such that the respondents lack in the minimum working vocabulary that a student of Classes VII-VIII should have.
- (b) Content-words are generally not appearing to be mismatch because of the fact that the names of animals, the pronoun forms of the persons involved, can easily be substituted by like forms in the passage. But sometimes the structure-words such as the peculiar verb forms used in the passage are not accurately substituted.
- (c) Some peculiar structure-words are commonly used in the region from which the samples are selected, and are deeply rooted in the dialect-

usage of the students concerned. As a result, they use those words in filling in the gaps. But these words are generally mismatch so far as the literary (standard) style of the passage is concerned.

- (d) In some cases, miscomprehension of the ideas treated in the sentences is found responsible for selecting inaccurate substitutes.

In this way, the analytical study of the substitutes lead us to many unexplored corners in the students' world of language. The cloze test can be used as a diagnostic test also. Here every n-th word may not be deleted. The deletions may strictly be purposive. If the teacher wants to identify the disabilities of the students in using structure-words such as kriya, pratyay, avyay (tense forms and verbs, affixes, etc., he may select passages where these words occur frequently and most of these words can be deleted. While filling in these gaps, the students are to use particular forms and the teacher can identify the errors peculiar to the individual. Once diagnosis of misapplication is made, remedial teaching measures can be applied.

### *Possibilities of Multiple Choice Test*

In the cloze test, open responses are accepted if the tester gives credit to accurate substitutes as well, but in the multiple choice test, responses are restricted. Three or four responses are given for each item, of which only one is accurate. It can more or less objectively assess reading comprehension, because the scoring key is clear to any evaluator, irrespective of his minimum knowledge of the text given. In the cloze test, when alternate responses are allowed, for every deletion more than one substitute may fit in the context and the tester at every step will have to judge whether the substitute is accurate. In this way, in a test containing 100 deletions, the tester may come across hundred of substitutes which he has to evaluate and fall in a bewildering position. It is impossible to construct a scoring key beforehand for the test, if substitutes are allowed. In the multiple choice test, scoring key can be done well beforehand.

Again, in the multiple choice test, errors also appear to be interesting to analyse. Alternate responses also have a chance to be selected by the students who miscomprehend the passage. Thus miscomprehension caused by different socio-pedagogical factors can be identified and remedial programmes formulated accordingly. A detailed analysis of the errors committed by the students belonging to peculiar socio-economic groups can lead us even to evaluate the prescribed pieces in a language textbook in the light of socio-linguistic criteria of editing materials for such a text. -

However, as mentioned earlier, both the measures have their own merits and limitations. In some passages or in some narrative poems there may be such typical words which, when deleted, hinder comprehension very badly. In such cases multiple choice test is probably the best measure for testing reading comprehension, because here full passage is given and the reader has only to read and nothing

to add to the structure of the sentences. In narrative and descriptive poems where comprehension is primarily wanted, multiple choice test is perhaps the only good measure, and cloze test will not do the needful; the deleted words mostly cannot be replaced by substitutes because of their peculiar rhythmic character and some other special features. If at all a reader can put the actual word or can replace it by a matching substitute, it is not his reading comprehension but poetic creative imagination that is assessed.

On the other side, in some narrative descriptive prose where most of the words are in the working vocabulary of the students or they can easily be substituted by similar words without hampering the syntactic structures and a semantic frame of the sentences, cloze test is perhaps the best measure for testing reading comprehensive. Here, at every step, this reader has to comprehend the reading matter to fill in the deletions in the sentences that are going to be read. Sometimes he has to correct some wrong responses made in the previous cases after comprehending the whole or part of the passage.

However, these two measures are complement to each other, so far as action researches done by language teachers on reading are concerned.



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## Reactions to Frustration of Creative and Non-creative School-going Adolescents

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**A**S REGARDS creativity one pertinent question often crops up in mind : Do the creatives suffer from unusual problems of adjustment in coping with their life's stress, inadequacies, conflicts and frustration as the society is sometimes considered to be downright savage towards the creative thinkers?

In dealing with this issue, Torrance (1969) maintains that the creatives are likely to experience the thwarting of their creative urges characterized by independence of mind, toying with unconventional ideas, strong desire for explorations, non-conformity to group pressures, etc. either by maintaining (expression) or by sacrific-



icing (repression) their creative potentialities, because it is thought, the society in general is not ready, at times, to accept their divergency and/or infrequency in imaginations, fantasy, thinking or in action, which the creatives generally have, and, consequently, they are likely to face many unusual problems of adjustment, such as anxiety, isolation, frustration, melancholy, etc. and even serious personality disorganization. Sometimes, under the simultaneous influence of the 'expression' and 'repression' of their creative potentialities, it is assumed further that some creatives are likely to suffer from severe conflict—whether they would maintain creativity and become alienated or they would sacrifice creativity to mould themselves to the conventional social standards and consequently experience tension, frustration, depression, etc. Thus, the creative potentialities are likely to serve as two-edged saw to do mental wear and tear, and at the end of this discourse, perhaps it would not be unwarranted to opine that the creatives and the non-creatives are likely to experience frustration at different extent and these two groups are likely to have in their repertoire different patterns of reactions to frustration.

Although there is a dearth of literature relating to reactions to frustration of the creatives and the non-creatives, the studies encompassing creativity and mental health or adjustment or personality may indirectly help one to gain insight into this area of interest. In one tenet of research, it is found that the creatives suffer from tension and breakdown (Patrick, 1955), anguish (Murphy, 1958), mental ill-health (Barron, 1969) schizophrenia (Barlow, 1952), sense of guilt, (Roy Choudhuri, 1966) introversion and generally frustration (Verma, 1979) in comparison with the low creatives. On the contrary, some regard that creativity represents the fullest expression of psychological health (Blatin Parnes, 1971) because the creatives are more emotionally open than the non-creatives (Erikson, 1963). This assertion has been supported by a host of researchers (Lytton, 1971; Gopal, 1975; Gupta, 1977; Singh, 1980; etc.).

The present paper attempts to study how the creative and the non-creative rural adolescents differ in their reactions to frustration such as Directions and Types of Aggression and Group Conformity Rating (GCR), conceptualized by Rosenzweig (1944) and assessed through a semi-projective test. The findings of this study may help the parents, teachers and counsellors to understand the nature of adjustment of the creative and non-creative adolescents regarding their reaction patterns in frustrating situations so that they can be guided accordingly.

#### DEFINITION OF IMPORTANT TERMS

The terms Directions of Aggression, Types of Aggression, and Group Conformity Rating (GCR), coined by Rosenzweig (1944, 1978), may be defined in the following way :

*Direction of Aggression* means "the direction in which aggression is turned in response to frustration". three directions of aggression have been considered : (1) *Extraggession* (E-A) in which aggression is turned on to the environment, some person or thing, with anger or resentment; (2) *Intraggession* (I-A) in which aggression is turned by the subject upon himself, the associated emotions being guilt and remorse; (3) *Imaggession* (M-A) "in which aggression is evaded in an attempt to gloss over the frustration".

*Types of Aggression* means "the general manner in which aggression is marshaled in reactions to frustration". There are three types of aggression: (1) *Obstacle-dominance* (O-D) in which the "barrier occasioning the frustration stands out in the response"; (2) *Ego-defence* (E-D) in which "the ego of the subject predominates to defend itself"; and (3) *Need-persistence* (N-P) in which the solution of the frustrating problem is emphasized by pursuing the goal despite the obstacle.

*Group Conformity Rating (GCR)* means "An index of the degree to which the responses of the individual on the P-F (Picture-Frustration) conforms to those typically given by his normative group". GCR has been looked as the measure of an individual's frustration tolerance.

#### OBJECTIVE

The objective of the study was to find out as to what extent the creative and non-creative ninth grade rural adolescents differ in the Directions and Types of Aggression and GCR, assessed through a semi-projective test.

#### HYPOTHESIS

The major hypothesis was that the creative adolescents would differ significantly from the non-creative adolescents in their mean scores of Directions and Types of Aggression and GCR.

Actually this hypothesis was separated into seven components—three Directions of Aggression, three Types of Aggression and GCR, and each of them was tested separately.

#### METHOD

##### *The Sample*

The sample for the study consisted of two groups of ninth grade rural adolescents drawn from the total population of rural ninth grade students of two districts, Nadia and Murshidabad in West Bengal. Three schools, one boys', one girls'

## REACTIONS TO FRUSTRATION OF CREATIVE

and one co-educational, were randomly selected for this exploratory study and therefrom, randomly 170 students (101 boys and 69 girls) were randomly selected to administer the Sarkar Creativity Test (shorter version). From these 170, two criterion groups were identified on the basis of the total creativity scores obtained by each subject as follows :

1. **Creative Group :** These were the subjects in the top 27 per cent on the measures of creativity ( $N = 46$ ).
2. **Non-creative Group :** These were the subjects in the bottom 27 per cent on the measures of creativity ( $N = 46$ ).

### *Tools Used*

The Sarkar Creativity Test (SCT) is the only available valid and reliable test in Bengali, which is the mother tongue of the subjects. This test consists of three parts : Non-verbal Tasks, Verbal Tasks using non-verbal stimuli, and Verbal Tasks using non-verbal stimuli, like the Minnesota Test of Creative Thinking of Torrance (1969). The investigators decided to use a shorter form of the SCT and they assumed that only the Non-verbal Tasks and the Verbal Tasks using non-verbal stimuli would be sufficient for this exploratory study. Next, they decided not to use all the tasks included in the latter category and used only two. Thus, the creativity test battery used in the study included : Non-verbal Tasks (Circle Test and Incomplete Figure Test) and Verbal Tasks, using verbal stimuli (Unusual Uses Test and Similarity Test).

The Reactions to Frustration Test (RFT), developed by the senior author in Bengali, in the model of the Rosenzweig Picture-Frustration Study Technique, was used to assess reactions to frustration. The RFT, semi-projective in design, consists of 24 cartoon-like pictures, each depicting common frustrating situations in which the Bengalee adolescents are generally got involved both at home and school. In every cartoon, one character has been shown to say something that causes frustration to the other person in the picture. The subject is required to write (in the blank space in each cartoon) what the other person drawn in the picture would say in reply. This test has been found to be highly reliable and valid.

### *Analysis Design*

Group comparisons were made by applying-t-test and the level of significance chosen in testing the hypothesis was .05.

## RESULTS AND DISCUSSION

The table depicts the results of the study.

TABLE I  
Significance of Difference Between Means of Different Reactions  
to Frustration and GCR for Creative and Non-creative Groups

Reactions to Frustration and GCR	Creative Group (N = 46)		Non-creative Group (N = 46)		SE	t-values
	Mean	SD	Mean	SD		
E-A	51.13	12.90	57.04	15.35	2.99	1.98*
I-A	22.11	7.17	19.26	7.05	1.50	1.90
M-A	27.09	9.14	23.89	7.85	2.23	1.43
O-D	26.61	8.35	23.20	7.94	1.72	.24
E-D	58.20	8.16	58.83	9.68	1.89	.33
N-P	18.37	5.84	17.11	7.56	1.42	.89
GCR	48.59	10.13	40.59	10.68	2.19	3.65**

\*Significant at .05 level, \*\* Significant at .01 level

From the contents of the Table, it is revealed that the two groups differed significantly only in Extraggression (E-A) and Group Conformity Rating (GCR). The creative group was found to be less extraggressive (Mean=51.13) than the non-creative group (Mean=57.04); while the former group had more GCR mean (48.59) than the latter (Mean=40.59). A noteworthy feature of the results was that the two groups showed almost a similar pattern of responses in the three Types of Aggression (O-D, E-D and N-P).

Thus, the non-creative group had significantly more tendency to turn aggression to the external environment—something or person (E-A)—with emotions of anger and resentment, than the creative group. The non-creatives were habituated in using the mechanism of projection to protect their 'self', presumably from the fear of punishment as evidenced from the theory of frustration of Rosenzweig (1944). This trend, according to the interpretation of the P-F constructs of Rosenzweig, made by Falls and Blake (1949), explains that the non-creatives were schizophrenic, psychasthenic, generally and socially maladjusted, neurotic, introvert but less dominant. As a matter of fact, the creatives did not share such an unhealthy personality profile as the non-creatives; on the contrary, they seemed more adjusted because of the fact that they had the opportunity to express their creative urge considerably if not fully. This position may be supported by a host of previous findings related to the personality adjustment of the creatives. Among other results, it was found that the creatives possessed more psychological health (Blatt in Parnes, 1971), high self-concept (Gupta, 1977) high ego-strength, self-confidence and self-actualization (Jha, 1975), unfrustrated (Sansanwall and Jarial, 1979) and emotionally mature (Verma, 1973) than the low creatives.

The first trend of the study was also supported by the second one: The creatives were found to be more adjusted to the normal group as evidenced by their significantly higher mean score in GCR than the non-creatives. In other words, the creative group had comparatively more "frustration tolerance", and, therefore, the creatives had more "capacity to withstand frustration without failure of psychological adjustment, i.e. without resorting to inadequate modes of responses". Further, from the theory of frustration of Rosenzweig (1944) it was also revealed that the creatives had no marked signs of psychotic and neurotic, because according to him only individuals with low frustration tolerance would have such typology. This position has indirect support in many reports. Erikson (1963) asserts that the belief that "everything great in the world comes from neurotics" is not true. Kubie (1958), Roe (1959) and many others hold that this 'belief' is erroneous. Similarly, a creative may not be a psychotic. For example, in order to accomplish significant creative work, a scientist withdrawing from society and absorbing himself in research, may easily be judged as withdrawn or schizophrenic, although he is not so (Barlow 1952). Other studies have also found the creatives as tolerant to frustration (Ray Choudhuri, 1966), freedom from antisocial tendencies (Nair, 1976) less tensed (Mallapa and Upadhyaya, 1977). The first two trends, the investigators presume, faintly reveal that amongst the non-creatives some repression of creativity has occurred and, therefore, they as a group shared no good adjustment to their frustration.

A third but non-significant trend that appeared in the study was that the difference between the mean scores of the two groups in Intraggression (I-A) almost touched the .05 level of significance ( $t=1.90$ ) in favour of the creative group. This implied that the creatives turned aggression toward their 'self' more frequently with a sense of guilt, remorse or inferiority, tuned with displacement and isolation for 'the need for punishment' (Rosenzweig, 1944) in comparison with the non-creatives. This sense of guilt or inferiority of the creatives might have arisen from the fact that at least a substantial proportion of the creatives were unconventional; they were likely to be centred in their psychological isolation and estrangement from peers, teachers and others and, consequently, they presumably thought that it was inferiority of something on their part because of which they were minority of few. That is why they developed some form of guilt proneness (Goyal, 1974). But more study is required to arrive at a solid conclusion.

A fourth non-significant trend was that the creative group had higher mean score in Imaggression (M-A) than the non-creative group. This implied from the frustration theory of Rosenzweig (1944) that the former group had comparatively greater tendency, though not statistically significant, to gloss over the frustrating situation without showing any emotion with the attendant mechanism of repression (or self-deception) probably for the "fear of loss of love". It seemed that although a majority of the creatives had greater conflicts with their parents, peers, etc. (Paramesh and Narayan, 1977), at the same time they had high super ego

strength (Joshi, 1974) and strong feeling of belongingness (Nair, 1976). Presumably, for these contradictory psychological characteristics, the creatives evaded frustration for the fear of losing love and recognition from parents, peers, etc.

On the whole, the outcome of the investigation weighs against the assertion of Torrance (1969) and others as pointed earlier; while, on the other hand, the present study corroborates the findings of Blatt (in Parnes, 1977), Walberg (1969), Lytton (1971) and Singh (1980) which assert that the creatives are capable of coping with the frustrating situation realistically, competently and with adequate tolerance.

## CONCLUSION

Thus, in brief, the present study reveals that the creatives were comparatively more adjusted in responses to the frustrating situation. But it is not clear how far the index of good adjustment for the creatives was responsible for only creativity or intelligence (if not for any other psychological factors) which is generally defined as the 'capacity for adjustment'. This question may be answered by laying out a proper design in further studies. Secondly, amongst the non-creatives, how many had to sacrifice their creativity in the process of their development, could not be identified. A study of reactions to frustration of those individuals who have repressed creativity and have been adjudged to have low creativity, although they are potentially rich at their earlier stage of development, deserves importance by working out a much sophisticated design.

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## Ph.D. Theses Abstracts

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### *Human Values of High School Students in Different Types of Schools of Andhra Pradesh in Relation to their Socio-economic Status and Mass Media Exposure*

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**A**T a time when the country is faced with a crisis in all spheres, the urgent need of the hour is to develop a feeling of oneness, and educate children to develop high competency to meet the challenges of a new era. Education must therefore shape the child to be a model of excellence, teach him to develop competence values, develop survival skills and inter-relate with one's fellow beings with warm human feelings.

Value education must cut across class and religious barriers. The framework

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Osmania University (1988)



of the present research is based on the tenets of Humanist philosophy which stresses the need for rationality, faith in man, and humanitarianism in all of man's activity.

Value orientation of the child is a highly complicated and integrated developmental process, which involves various operative variables like the house, parents, peers, socio-economic status, quality of school, competent teachers and the child's exposure to different mass media. This research brings out in focus the relative influence of the operative forces of socio-economic status, the school and mass media exposure in influencing value orientation.

#### MAIN OBJECTIVES OF THE STUDY

1. To identify different human values and their inter-relatedness with a view to incorporating them in teaching programmes.
2. To develop a convenient tool for measurement of value judgements, which is suited to Indian conditions.
3. To identify specific association of dependent variables like socio-economic status, school efficacy and mass media with value orientation.

#### HYPOTHESES

1. There is no relationship between the types of school managements and the levels of human values of the students studying in these schools.
2. There is a positive association between the levels of Socio-Economic Status (SES) of the students and their levels of human values.
3. There is a positive association between Parental Income (PI) and the levels of human values.
4. There is no association between the religious background of the students and their levels of human values.
5. There is a positive relationship between the SES of the students and their Mass Media Exposure (MME).
6. There is a positive relationship between Parental Income (PI) and Mass Media Exposure (MME).
7. There is a positive association between Mass Media Exposure (MME) and human values.
8. There is no relationship between the types of school managements and the levels of Mass Media Exposure (MME).
9. There is no relationship between the types of schools selected by the parents and their Socio-Economic Status (SES).
10. This is no relationship between the types of schools opted by the students and their Parental Income (PI).

METHODOLOGY

*Tool Development*

1. Identify various value aspects out of a total of 143 values chosen from various source documents such as NCERT, Satya Sai, Jesuit and Rama Krishna Mission, Maslow etc.
2. Development of a suitable questionnaire to study the level of value judgement of the students in respect of 36 value aspects of two main core values viz. Striving for Excellence and Relatability with other.
3. For each value aspect positive and negative statements were framed which matched with the scope and definition of each value.

*Sampling Trials*

Sampling trials were made initially on 57 students in eight schools and repeated on 15 students to ensure proper comprehension by the students.

*Tool Reliability*

Tool reliability was established by test sampling on a group of 83 students and repeated after 21 days. The reliability coefficient was found to be 0.79. The questionnaire was translated into the vernacular and tested on 49 students to confirm tool reliability.

*Measures of other Dependent Variables*

1. The researcher also developed a rough tool for measuring the quantum of Mass Media Exposure.
2. The researcher adopted the SES scale developed by S.Narayan Rao to measure dependent variables of Socio-economic Status, and codified the various parental income groups and religious segments.

*Scoring Method*

The responses of the students were scored on a five-point rating scale for positive and negative statements. Based on the frequency of the scoring pattern, the student responses were allotted scaled scores as per the Internationalism scale described by Garrett to facilitate accurate comparison of student scores, and to make indepth analysis.

Other dependent variables like school categories, socio-economic status, religious segmentation, parental income levels and mass media exposure were codified and tabulated to facilitate comprehensive analysis in relation to the different variables under study.

### *Sample Profile*

The questionnaire was administered to a large sample of 1650 students located in 66 schools 36 in the twin cities of Hyderabad and Secunderabad and 30 in 15 towns of three different regions of Andhra Pradesh.

### *Statistical Techniques*

Other statistical tools like percentile analysis, calculation of coefficient of correlation, F tests and chi-square values enabled the researcher to conduct detailed analysis of the inter-relatedness of the values, the relative influence of the different variables, and the proper associations of the positive and negative statements as a measure of the same value concept."

The cluster analysis arrived at by the calculation of the co-efficient of belongingness helped to identify different value clusters.

The large sample size (1650) and scaling helped to devise a scoring table for different responses to the positive and negative statements on a five-point scale and thereby standardise the Human Value Judgement (HVJ) Scale.

### *Analysis and Interpretation of Data*

1. The average school scores, i.e. the scores of the students in rank order and percentile analysis, comparison of the scores of the students with the same SES, religious background, parental income and mass media exposure, all highlight the fact that there is a distinct trend towards better quality education in Mission and special category schools as opposed to the Government schools resulting in better scores on the HVJ scale.

2. The results show a direct relationship between the SES levels and the HVJ scores, in descending order.

3. The results further show a possible relationship between the HVJ scores of the students and their religious background, particularly the low scores of certain segments like BCs, SC/STs and Muslims, which is suggestive of economic deprivation and alienation from society.

4. A study of the HVJ scores and parental income in relation to religious segments suggests that in certain cases there is a tendency of values getting distorted at higher income levels.

5. There was a direct positive relationship between the HVJ scores and the levels of mass media exposure.

6. The cluster analysis shows that except for four value aspects viz. Faith in Man, Dependability, Sense of Beauty and Dignity of Labour, other values form into two main clusters which can be termed as the value aspects of the two core values which are :

## INDIAN EDUCATIONAL REVIEW

A. Striving for excellence which includes the value aspects of discipline, clear thinking, courage to face reality, personal conviction, perseverance, self-study, devotion to work, freedom to act, sportiveness, citizenship, equality, humility to accept and correct mistakes, self-reliance, adaptability, appreciating others capabilities, truthfulness and curiosity (personal values).

B. Value of relatability (concern for others) which includes the value aspects of courtesy, sharing, compassion, availability, community, spirit, forgiveness, respect for other rights, mutual acceptance, sharing social service, national consciousness, appreciation of others cultural values, cooperation readiness to espouse a common cause, and value for public prosperity.

It is thus possible to identify twelve main value aspects of the above two core values, which together with the four unrelated values could form the basis of future education programmes.

## MAJOR FINDINGS

1. The study highlights what values must be stressed.
2. It has evolved a HVJ scale, which is standardised after following the required statistical procedure in respect of the sample in Andhra Pradesh.
3. It identifies the sociological and other factors associated with human value orientation viz.
  - minimum physical facilities for basic growth and development.
  - wider mass-media exposure.
  - well-planned value clarification programmes, and
  - better opportunities for self-analysis leading to the development of the self concept.

Thus, this study has opened new vistas in the field of value education for more indepth thought on a subject which has assumed great significance in the last few years.



*Education in a Village of Jammu and Kashmir*

B.L. RAINA

**E**DUCATION is the greatest instrument man has devised for his own progress. It influences lives of more people than any other organisation. Dynamic and progressive nations demand education that takes leadership in piloting and manning a future which will assure a better life to all. Education is usually thought of as a gate way to the specious world. Education in developing nations is an influencing process, a promotor of social change and a supportive system for development in general, i.e. individual as well as societal. Learning transmitted through educational institutions percolates to almost all sections of society. Education is an interactive process between the learner and his environment. It cannot remain indifferent to the dynamics of immediate environment in which it operates. Education in the process of development can be seen from two different angles: as a means and as an index of development. In spite of expansion of educational opportunities in the developing countries targets of literacy have not been achieved.

India is a vast country with a rural bias. There are 5.26 lakh villages, where in 76 per cent of its population resides in different geographical, social and economic conditions. Out of the total working population, 70 per cent are engaged in agriculture and allied activities, 9.5 per cent in industries and rest in trade, commerce and allied activities. Even out of those who are employed in industry, six per cent are employed in rural industries like cottage, handicrafts, dairy, etc. The rate of migration from rural to urban areas in the last decade, i.e. 1970-81, has been negligible. Hence, rural character has been retained in India. It is characterised by intense population pressure, unemployment and under-employment, malnutrition, poor health and sanitation, backwardness and above all illiteracy. People are still traditional and resistant to change.

If attention is drawn towards the educational system in Jammu and Kashmir, certain peculiarities are found. The State has the unique distinction of having free education at all levels (primary to university). Educational facilities are expanded far and wide, covering 97 per cent of the population. Education is in the public sector and expenditure on the same is 20.24 per cent of the total budget. Mobile schools are maintained for the nomadic tribes of Gojars and Bakharwals seasonally.

In spite of the efforts of the State government for the expansion of education, enrolment is very thin. It is 1.57 lakhs for boys and 0.79 lakhs for girls. Jammu and Kashmir is bestowed with special status in the Indian union and gets special grants for educational and developmental programmes from national government. Yet it has not made headway in different sectors. Education in rural areas is not up to the mark. The problems of enrolment, wastage, non-utilisation of educational facilities, illiteracy, low productivity and non-utilisation of development programmes are a matter of concern in rural areas. Such conditions that are prevalent in the State, in spite of special efforts made, pose several questions : When educational expansion is no more a problem, why literacy percentage is so low? In spite of free education, what are the reasons for non-utilisation of educational facilities? Do the rural population perceive that education is not worth receiving? How has education influenced the people of different religious groups in the village? Why is rural population not taking advantage of the developmental programmes launched by State Government?

Seeking answers to these questions, necessitates several systematic studies which can bring several social, cultural, political, religious and educational aspects under close scrutiny. This becomes significant in the light of the fact Jammu and Kashmir has a population with varied socio-cultural environment in different regions. The geographical location of the State also adds much to the difference among places. Two villages in the same district cannot be same in language, agriculture, style of life, and so on. Studies conducted at micro level may not provide any insight in to the problems existant at micro level. Studying the way education has operated in such a distinct socio-cultural context requires a deep understanding and scrutiny of several factors as they obtain in the environment. Village is one such manageable unit providing for deep insight in to the different socio-cultural, politico-economic and educational factors operating at the grassroot level. Hence a village was taken as a unit for study.

### OBJECTIVES

The study was carried out with the following objectives:

1. To study quantitative indicators in terms of number of schools, infra-structural physical facilities, enrolment sustenance and dropouts.
2. To examine the invovlément of functionaries and community members in educational activities—
  - Role played by teachers and administrators in motivating and sustaining pupils.
  - Participation and reaction of parents and community members towards educational activities.
  - Participation and reactions of functionaries in the developmental programmes.

3. To study the elemental characteristics of education and processes generated in terms of—
  - Relevance to local environment and conduciveness to development.
  - Education and its effect on the life of people.
  - Possible interactions between education and other aspects of life, such as social, political, cultural and religious.
  - Developmental programmes in operation in the selected village, their nature, role of functionaries and educational components in them.

### NATURE OF DATA

Since the study was of socio-cultural nature and the educational development of the rural community was the focus, the kinds of data to reveal the phenomena were of quantitative and qualitative nature. The qualitative data pertained to the facts and figures related to school education in the village, including information pertaining to pupil enrolment in all educational institutions, retention as well as drop-outs rates, staff patterns, and so on.

### SAMPLE

As the study involved an inquiry into the socio-cultural context, sampling in the usual sense of the term was not be feasible. Besides, the investigator's familiarity with such a context, with special reference to language and people, could aid a free interaction and help in an indepth discerning of the educational components needed as data. In view of these, one village Nanil in the tahsil and district Anantnag served as a sample for the study. The rationale for selecting the village has already been indicated.

Within the village, it was necessary to select respondents from different categories. As the data were fluid, so random sampling in the actual sense could not be adopted for the selection of prespecified numbers of respondents. The sample had to be selected from different categories of people in the village, four example, the category of village leaders had to be selected from among the eminent persons in the village with a standing over time. Likewise, educated employed who had some standing and were well educated to understand quiries, had to be selected. Availability of the respondent category had to be ensured. In consideration of these, from each category the actual number of those available had to be contacted. An incidental sample of respondents and a purposive sample of categories of respondents led to actual number in each category according to the availability of the sample units.

## INDIAN EDUCATIONAL REVIEW

### TOOLS OF DATA COLLECTION

In order to obtain data from the sources mentioned, tools were developed for each category of respondents. The developed tools were :

- Information schedule for factual data from schools.
- Information schedule for the collection of data from developmental agencies.
- Questionnaire for headmasters and teachers of schools.
- Questionnaire for instructors and supervisors of non-formal education.
- Interview schedule for Block Education Officer.
- Interview schedule for Block Development Officer.
- Interview schedule for Block Medical Officer.
- Interview schedule for Project Officer, District Rural Development Agency.
- Interview schedule for village-level workers.
- Interview schedule for village Patwari.
- Interview schedule for village leaders.
- Interview schedule for educated employed in the village.

The tools were developed, keeping in view the several aspects to be covered. A large number of items for each tool were developed. The tools has developed were scrutinised by experts and their tried out in the field for further sharpening. The process was carried out prior to final data collection. In addition, field notes, general discussions and general observations also served as tools for gathering data.

### ORGANISATION OF DATA COLLECTION

Data collection in a qualitative type of studies is a tedious job. The data were collected in four different phases. These phases were spread over a period of three years from December 1983 to December 1986. Keeping in view seasonal variations and changes in the political scene, field trips to the village were arranged accordingly. The investigator planned his stay in the field according to the requirements of certain aspects that needed observation and general discussion, e.g. parliamentary elections, harvesting season, winter hazards, plantation of paddy and process of taking out charas from hemph plans etc.

### SCHEME OF ANALYSIS

The data that were collected were analysed in quantitative and qualitative terms, so that meaningful trends and conclusions on the process of education in a rural setting could be visualised. The data obtained through a survey of different documents and information schedules were analysed quantitatively. These data were presented in percentage tables. Wherever it was possible, year-wise trend of school factors was provided in a quantified form,



The qualitative data obtained through questionnaires, interviews, general observations and general discussions were analysed qualitatively, since the quantification of such data was not possible. Qualitative analysis can also be as clear and objective as quantitative analysis, provided the frame of reference is clear. The qualitative data were presented in description variable-wise. Data presentation and interpretations were made in theoretical form. The data collected through general observations and discussions were also presented and analysed in a descriptive form.

Interviews of developmental agencies' functionaries were analysed with reference to the programmes in vogue and the educational components therein. Since the study was focused mainly on the process of education, educational components were highlighted during interpretation. Different views expressed by different people on the educational process of any form were consolidated and presented in support of the quantified data.

#### FINDINGS

The findings of the study are :

1. Increase in schooling facilities did not affect the enrolment position much. Enrolment has not been proportionate to schooling facilities. Enrolment at the middle school stage has been better than at the high school and primary school stage. The village schools attracted students from the closeby villages. But when the enrolment of local students was scrutinised with reference to village population, it was very nominal.
2. There was no volutary effort from the side of teachers or administrators for enrolment drive. Schools, though well-equipped, did not attract the students. The teacher-pupil ratio in the village was less than the national and state ratios. Though there was a positive relation between provision and utilisation of educational facilities, yet the facilities were not being utilised to the optimum. There were about 50 per cent boys and girls in the 6-14 years age-group who were out of the village schools.
3. The enrolled students belonged to economically well-off families and were mainly from feeding areas. The non-enrolled group belonged to the labour class and other weaker sections of the village.
4. The lowest enrolment was found in the girls' schools. It was only 12 per cent of the total women population in the age-group 6-14 years. The main reasons were, ill-equipped girls' schools, inefficient staff and indifferent attitude of parents towards girls' education.
5. The highest dropout rate was found at the high school stage, whereas it was very nominal at the primary and middle school stage. The high-

- est dropout rate of 12.95 per cent was at the high school stage in 1985, whereas in the same year it was zero at the middle and primary stage. The highest number of dropouts were in the year 1970 in the high schools (40.81 per cent) and primary schools (33.70 per cent).
6. Inspection notes in the school records revealed that inspecting authorities did not inspect schools even once in a year. Even if they did so, the inspections did not benefit teacher or school administration. Supervision notes were not maintained according to official proforma. The officers did not maintain the inspection diaries in their offices and school inspection notes did not read more than a signature of the officer concerned. During the period 1965-1985 the village high schools were inspected by provincial heads only once.
  7. Adult education facilities in the village were almost non-utilised. The two centres that were functioning were not attended even by one adult. All the enrolled people were school-going students. They utilised the facility for religious education. However, in the year 1984-85 31 people were enrolled at the adult centre.
  8. Craft and social welfare centres attracted more people for enrolment than schools. Restrictive admissions at the craft centre did not affect school enrolments in boys' schools. It did affect girls' school enrolments during the functioning of the centre.
  9. The response of the community was very poor so far as enrolment drive and developmental activities of the school were concerned. However, the community was involved in the construction of school buildings and they took initiative in providing land for school buildings in the village.
  10. With regard to the purchase of furniture and other permanent equipment/consumable articles, a district purchase committee headed by district education officer took decisions to approve the names of different firms for all the school purchases.
  11. Education has led to migration from the village. Almost all the educated people from the village have migrated to different places in and outside the states.
  12. Educational inputs of the developmental programmes have raised the awareness level of the villagers, with the result the village people have shown interest in such programmes and have been utilising the programmes according to their interests.
  13. Villagers were not satisfied with the functioning of education in the village schools. They were satisfied with the process of education during the sixties. It was found that their participation in school activities was not sought by the school functionaries.
  14. Parent-teacher relation was not visible in the village. Teacher-pupil relation was also found to be vanishing.

## MAJOR OBSERVATIONS

On the whole, certain broad observations can be made regarding the role of education when seen in the light of the findings of the study and its broad theoretical perspective. The increasing emphasis on formal education and the multiplicity of demands loaded on individuals in terms of knowledge and skills has not considerably weakened the functional effectiveness of other more non-formal and informal social agencies, such as family, religion, neighbourhood, in equipping people for the same. At the same time, formal education has become significant manipulative force in the hands of the polity, which has a great potential and yet is succumbed to the unavoidable bureaucratic structure established by it.

Education has come to be an essential part of any local cultural unit. It can be stated on the basis of the fact that schools are accessible to people and have been operating for a fairly long period now. However, the acceptance and adaptation of education in a local context is the result of political sustenance or of local awareness and willingness on the part of villagers is not yet clearly discernible. In other words, schools have come to stay, perhaps, due to the procedural requirement and political commitment of the government machinery.

While educational facilities up to school levels are accessible to almost all people in the local context, higher education has not reached remote rural places much. Even moderate villages like Nanil which have a population of less than 10,000 have more than one school. The benefits of this seems to be accrued to certain sections of population only. This points out that the failure of schools to encompass the entire target population in the local context has not been due to accessibility of facilities. That is, school education has not been very successful in convincing the local population of its relevance, as enrolment, though increasing over the years in absolute numbers, has been consistently falling short of the targets. Especially the priority section of the population, viz. women/girls, seems to be not utilising the facilities available.

Another observation is that the nationalised channel of school education in the form of state-run schools has been mainly responsible for success in making education available to remote regions. Private ownership, perhaps, would have found it economically very non-viable to run schools in those areas. At the same time, it is this state control that seems to have made school education less convincing as an imposed activity for political purposes. The present study reveals that there is a clear mismatch between the official provision and the locally perceived needs and utility in respect of schools. Being under the state control, it brings, per force, into the entire organisation and implementation of school education certain uniformity as regards staff structure, admission procedures, curricular planning, examinations and so on. Decisions always seem to be taken outside the village and any local involvement is due to the political position in the local system or it satisfies the official requirement rather than as an indication of local initiative and

interest. This feature seems to affect the effective utilisation of education as a local resource. The present study reveals that any locally perceived ways of making school education functionally relevant is a matter of individual opinion and not a collective view.



### *Spatial Variations of Literacy in Andhra Pradesh*

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**M**ANY of the states in India have been characterised not only by low literacy rate but also by regional disparities in the literacy rate. These literacy disparities obviously pose a serious problem to the socio-economic development of the country as a whole. Regional disparities in the literacy rate have been largely attributed to several quantitative and qualitative factors.

An examination of the current literature indicates very few research studies dealt with the spatial variations of literacy in India by the geographers, economists and educationists. But most of those studies have analysed the literacy situation in relation to very few factors by leaving off other factors, which could have definitely influenced the literacy levels. Further, none of them have attempted to identify the factors for the spatial variations in literacy with the aid of suitable statistical techniques. Against this backdrop of lacuna in the earlier studies, an attempt has been made in the present study to analyse the spatial variations of literacy in Andhra Pradesh and to examine the relevance of socio-economic and demographic factors for such variations.

## OBJECTIVES

The specific objectives of the present study were (i) to study the trends and patterns of literacy in Andhra Pradesh; (ii) to examine the nature of relationships between literacy and socio-economic-demographic factors (Predictor variables); (iii) to analyse those factors which explain the variance in literacy and to assess the extent of variance explained by a set of variables on the literacy rates of different districts; and (iv) to suggest some policy recommendations for improving the literacy rates as well as for reducing the spatial variations of literacy in Andhra Pradesh.

## PREDICTOR VARIABLES

Predictor variables, which are socio-economic and demographic in nature, were selected for the study. The 41 selected predictor variables were assumed to have been functionally and areally related to the literacy rate. These predictor variables ( $X_1$  to  $X_{41}$ ) were grouped into the following ten broad categories:

- (i) Literacy disparity indices ( $X_1 - X_3$ )
- (ii) Population characteristics ( $X_4 - X_9$ )
- (iii) Occupational characteristics ( $X_{10} - X_{13}$ )
- (iv) Urbanisation ( $X_{14}$  and  $X_{15}$ )
- (v) Primary education characteristics ( $X_{16} - X_{19}$ )
- (vi) Educational resources ( $X_{20} - X_{23}$ )
- (vii) Continuing education characteristics ( $X_{24} - X_{26}$ )
- (viii) Agricultural characteristics ( $X_{27} - X_{30}$ )
- (ix) Industrialisation ( $X_{31}$  and  $X_{32}$ )
- (x) Socio-economic characteristics ( $X_{33} - X_{41}$ )

## COLLECTION OF DATA

Cross-sectional data on the predictor (socio-economic and demographic) variables were collected at the district level for the year 1981. The data were drawn mainly from the publications of Census of India, Bureau of Economics and Statistics, Director of School Education, Centre for Economic and Social Studies and The Planning, Monitoring and Statistics Division of the Union Ministry of Education and Culture.

## STATISTICAL TECHNIQUES USED

In accordance with the objectives of this study, Growth index and Rank order scores were employed to assess the trends and spatial patterns of literacy in Andhra Pradesh. Analysis and explanation of the spatial variations in the literacy rates

among the districts of Andhra Pradesh were done with the aid of appropriate and advanced statistical techniques. The relationship of literacy with each of the 41 socio-economic-demographic variables was studied with the help of Correlation co-efficients. Multiple regression analysis formed the core technique in this research. The effect of each group of variables on the prediction of literacy was assessed by means of regression models. Variation in the amount of explanation given by each regression model (comprising a group of variables) on the literacy rates of 23 districts was visualised by means of residual analysis.

#### TRENDS AND PATTERNS OF LITERACY IN ANDHRA PRADESH

The analysis has revealed the following observations:

- (i) The number of literates in Andhra Pradesh increased from 5.7 lakh in 1901 (3.0 per cent of the total population) to 160.3 lakh in 1981 (29.9 per cent). But the growth rate of literacy in Andhra Pradesh has not been able to keep pace with the growth rate of population. The absolute number of illiterates in the State has also tremendously increased during the same period, i.e. 1901-1981.
- (ii) The growth index of literacy in Andhra Pradesh has shown a negative trend during 1901-1911; and later it recorded a rapid growth until 1961. It was interesting to note that Andhra Pradesh has exceeded India's literacy growth index during 1941-51 and 1951-61. The growth index during 1961-71 has, however, declined to 4.28 per cent and later it has increased to 7.02 per cent during the decade of 1971-81. It was undoubtedly a significant improvement over the previous decades, but the increase was slower than all India's increase of 9.61 per cent.
- (iii) There was a gradual increase in the literacy rates of different districts during all the census decades, but growth rates of literacy have never been uniform among the districts of Andhra Pradesh. Some of the districts have made good progress in the literacy rate, while some others have lagged behind. Of the 23 districts, Hyderabad has consistently occupied the first rank and Adilabad the lowest throughout the period from 1951 to 1981.
- (iv) According to the 1981 census, there have been wide variations in the literacy rates in the districts of Andhra Pradesh. The percentage of literacy is found to be highest in Hyderabad district (58.33 per cent), followed by Krishna (41.71 per cent) and West Godavari (37.61 per cent) districts. On the other hand, Adilabad district records the lowest literacy rate of 18.79 per cent, as against the State's average literacy rate of 29.9 per cent. The literacy rates in the districts of Ranga Reddi (29.41 per cent), Prakasam (29.39 per cent) and Anantapur (29.02 per cent) are almost equal to the State's average.

- (v) The districts, based on their literacy rates, have been grouped into the following five regions:
- (a) Region of Very High Literacy (above 35 per cent) : East Godavari, West Godavari, Krishna, Guntur and Hyderabad.
  - (b) Region of High Literacy (30-35 per cent) : Nellore, Chittoor and Cuddapah.
  - (c) Region of Medium Literacy (25-30 per cent) : Visakhapatnam, Prakasam, Anantapur, Kurnool, Ranga Reddi and Khammam.
  - (d) Region of Low Literacy (20-25 per cent) : Medak, Nizamabad, Karimnagar, Warangal, Nalgonda, Vizianagaram and Srikakulam.
  - (e) Region of Very Low Literacy (below 20 per cent) : Mahabubnagar and Adilabad.

## MAJOR FINDINGS

### *Relationship of Literacy with Predictors*

The relationship of literacy with the 41 socio-economic and demographic (predictor) variables was examined. Out of the 41 variables, 29 variables, were closely associated with the literacy rate. They were: Male-female disparity index ( $X_1$ ), Rural-urban disparity index ( $X_2$ ), SC and ST—non-SC and ST disparity index ( $X_3$ ), Proportion of population to the State's population ( $X_4$ ), Density of population ( $X_5$ ), Per cent of male population ( $X_6$ ), Per cent of SC-ST population ( $X_7$ ), Per cent of working population ( $X_8$ ), Per cent of women in the total work force ( $X_9$ ), Per cent of non-agricultural workers ( $X_{10}$ ), Per cent of women in non-agricultural activities ( $X_{11}$ ), Per cent of non-agricultural workers in rural areas ( $X_{12}$ ), Employment rate in public sector establishments ( $X_{13}$ ), Per cent of urban population ( $X_{14}$ ), Area served by primary schools ( $X_{16}$ ), Population per primary school ( $X_{17}$ ), Per cent of girls enrolled in primary schools ( $X_{19}$ ), Proportion of educational expenditure to the State's education expenditure ( $X_{20}$ ), Proportion of expenditure on primary education to total education ( $X_{21}$ ), High schools per lakh population ( $X_{25}$ ), Per cent of net area shown ( $X_{27}$ ), Per cent of net irrigated area ( $X_{28}$ ), Agricultural productivity per hectare ( $X_{30}$ ), Per cent of female literacy ( $X_{33}$ ), Bank offices per lakh population ( $X_{37}$ ), Road length per 100 sq.km. ( $X_{38}$ ), Number of buses per lakh population ( $X_{39}$ ), Per capita income ( $X_{40}$ ), and poverty ratio ( $X_{41}$ ).

### *Prediction Models Explaining the Spatial Variations in Literacy*

The 41 predictor variables, grouped into ten categories, were further used in

the multiple regression analysis to build different prediction (regression) models of literacy. The multiple regression results have revealed that the nine models have well explained the variance in the literacy rate. The order of the models was: socio-economic (model-X), literacy disparity index (model-I), educational resources (model-VI), population (model-II), urbanisation (model-IV), occupation (model-III), agriculture (model-VIII), primary education (model-V) and industrialisation (model-IX).

One or two significant variables in each of the above models have contributed maximum variability in the literacy rate. The crucial variables, that explain maximum variance, in different models are given hereunder:

- |                                  |   |
|----------------------------------|---|
| (i) Literacy disparity index     | —Male-female disparity index ( $X_1$ ,<br>and Rural-urban disparity index ( $X_2$ ) |
| (ii) Population model            | —Per cent of working population ( $X_8$ )   |
| (iii) Occupation model           | —per cent of non-agricultural workers ( $X_{10}$ )                                  |
| (iv) Urbanisation model          | —per cent of urban population ( $X_{14}$ )  |
| (v) Primary education model      | —Population per primary school ( $X_{17}$ )   |
| (vi) Educational resources model | —Proportion of education expenditure to state's education expenditure ( $X_{20}$ )  |
| (vii) Continuing education model | —   |
| (viii) Agriculture model         | —Per cent of net irrigated area ( $X_{28}$ )  |
| (ix) Industrialisation model     | —Industrial workers per lakh population ( $X_{31}$ )                                |
| (x) Socio-economic model         | —Per cent of female literacy ( $X_{33}$ )   |

The correspondence of the above conclusions with respect to geographic reality has been shown by the residual maps which indicate how well the generalisations apply on the 23 districts. The synthesis of the residual analysis is given below :

- (i) The literacy rate has been well explained by the literacy disparity index model in almost all the districts, except Visakhapatnam and Krishna districts in Coastal Andhra Region, Chittoor and Anantapur districts in Rayalaseema region and Hyderabad, Medak and Warangal districts in Telangana region.
- (ii) The population model, though not an important one in explaining the literacy rates in the districts of Krishna, Guntur, Nellore and Nizamabad, could provide much explanation in the remaining districts of



Andhra Pradesh. Some other factors, which are not considered in this model, may explain the variation in the literacy rates of the above four districts.

- (iii) The occupational model has well explained the literacy rates of almost all the districts, with an exception of the districts of West Godavari, Krishna and Guntur.
- (iv) It is also noted that the literacy rates of all the districts, barring West Godavari and Krishna, are well explained by the urbanisation model.
- (v) The literacy rates in the districts of Krishna, Cuddapah, Chittoor and Ranga Reddi are not fully explained by the primary education model. This may be due to interaction of some other variables which have not been considered in this model.
- (vi) The educational resources model has not adequately explained the literacy rates in the districts of West Godavari, Krishna, Nellore, Cuddapah and Ranga Reddi, but it is found to be an adequate one in the remaining 18 districts of Andhra Pradesh.
- (vii) The agricultural model could fully explain the variability in the literacy rates of all the districts, except Hyderabad district which is an urban agglomeration and has a very limited area under cultivation.
- (viii) The industrialization model is adequate in explaining the literacy rates of almost all the districts, except those of Krishna and Hyderabad. The high literacy rates of these two districts may be well explained by the other variables which are not considered in this model.
- (ix) The socio-economic model is found to be inadequate in explaining variance in the literacy rates of Prakasam, Cuddapah, Anantapur, Ranga Reddi and Hyderabad districts. However, it has adequately explained the literacy rates in the remaining districts.

#### SUMMARY OF RECOMMENDATIONS

Since the predictors, which are represented in different models (viz. socio-economic, literacy disparity index, educational resources, population, urbanisation, occupation, agriculture, primary education and industrialisation) have explained most of the variation in the literacy rates, some policy recommendations/measures have been suggested in different sectors on the basis of the outcome of the models. Investment in these sectors would be indirectly helpful in the growth of literacy in different districts, thereby contributing towards reduction in the regional disparities of literacy in the State. Hereunder are specific recommendations relevant to different districts:

- (i) There is a need for an increase of female literacy in the districts of Srikakulam, Vizianagaram, Visakhapatnam, Nellore, Kurnool, Mahabubnagar, Medak, Nizamabad, Adilabad, Karimnagar, Warangal, Khammam and Nalgonda.

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2. To know if class clowns are different from non-class clowns in cognitive variables, viz. abstract reasoning, mechanical reasoning, numerical ability, space relations, verbal reasoning, language usage (grammar and spelling) and clerical speed and accuracy.
3. To know if class clowns differ from non-class clowns on various personality characteristics.
4. To know the difference in reference to sex.

## HYPOTHESES

The following null hypotheses were formulated for the study :

1. There will be no difference between class clown and non-class clown students on various cognitive variables.
2. There will be no difference between class clown and non-class clown students on various personality factors.
3. There will be no difference between class clown and non-class clown students with reference to sex.

## SAMPLE

The sample consisted of 396 students (198 class clowns and 198 non-class clowns) of 12 intermediate colleges situated in the Kumaon region of Uttar Pradesh.

## TOOLS USED

1. To spot the class clowns, sociometric device was used. It was developed by the investigator along with Dr (Miss) A.R. Bisht.
2. For measuring the cognitive variables, the Differential Aptitude Test of J.M. Ojha was used.
3. The personality variables were measured by Dr S.D. Kapoor and K.K. Mehrotra's Jr. Sr. High School Personality Questionnaire.

The sociometric device helped to know the names of three students who were perceived as class clowns by their classmates.

## PROCEDURE

The sociometric device was administered to the students and they were given instructions to write down the names of three clown students. Three class clown students were selected as a sample from every section of Classes IX and X and, similarly, three non-class clown students were selected randomly from these classes. After selecting 396 students, they were administered the differential aptitude test and the personality questionnaire. All the answer-sheets were scored with the help of scoring keys.

## STATISTICAL TECHNIQUE

The 't' test was used to find out the significance of difference between the class clown and non-class clown students on cognitive and personality variables.

## MAIN FINDINGS

The main findings drawn from the present study are summarized as under:

1. Class clown students are significantly higher than non-class clown students in abstract reasoning, verbal reasoning, language usage (grammar and spelling) and clerical speed and accuracy.
2. Male class clown students are significantly higher than male non-class clown students in verbal reasoning, language usage (grammar and spelling) and clerical speed and accuracy.
3. Female class clown students are higher than female non-class clown students with regard to abstract reasoning, numerical ability, space relations, verbal reasoning, language usage (grammar and spelling) and clerical speed and accuracy.
4. Male class clown students are significantly higher than female class clown students in mechanical reasoning, numerical ability, space relations and female class clown students are significantly higher than male class clown students in abstract reasoning, verbal reasoning, language usage (grammar and spelling) and clerical speed and accuracy.
5. Class clown students significantly differ from non-class clown students on personality factors C, F, G and H.
6. Male class clown students are significantly different from male non-class clown students on personality factors C, H, O, Q<sub>3</sub> and Q<sub>4</sub>.
7. Female class clown students are significantly different from female non-class clown students on personality factors F, G, H, I and Q<sub>3</sub>.
8. Male class clown students are different from female class clown students on personality factors A, B, F, G, I, Q<sub>2</sub>, Q<sub>3</sub> and Q<sub>4</sub>.

The findings of the study may be helpful to the teachers in understanding the role of different class clowns and non-class clowns in cognitive and personality variables. Such knowledge may be of great help to the teachers and counsellors in guiding the students.



## *Cloze Tests as a Measure of Readability : A Critical Study*

(DR) M.A. TAMBOLE

**R**EADABILITY of a book or any reading material is primarily concerned with the reading difficulty level of the textual matter. This, in turn, is dependent on the content, style and complexity of the text. We may define readability, in a simpler way, as the level of success with which a given class of readers can read with ease, interest and comprehension.

There are three levels of readability: (i) Independent level: The books which the pupils can read and comprehend by themselves without the help of the teacher may be said to be of the Independent level, (ii) Instructional level: The books which the pupils find rather difficult to read and comprehend by themselves but which they can read with comprehension and enjoyment with the help of the teacher are said to be of the Instructional level, (iii) Frustration level: The books which the pupils cannot comprehend even with the help of the teacher may be said to be of the Frustration level. It is obvious that the readability of a textbook prescribed for a particular standard should be of the instructional level. Then and then alone can the pupils learn it in the classroom with interest, profit and enjoyment.

There are four methods of assessing the readability of a book. They are: (i) Reading Comprehension Tests, (ii) Reading Formulae, (iii) Graphs and Charts and (iv) Cloze Tests. Out of these four methods, the cloze tests are the simplest and easiest to administer and they are also a valid and reliable measure of readability.

The term 'cloze' is related to the Gestalt concept of closure, which signifies the human tendency to complete a structured whole by filling in any missing gaps which might exist in the stimulus pattern. W.L. Taylor in 1953 linked the process which individuals go through in filling in a cloze blank, the process of closure in Gestalt Psychology. He defined the cloze unit as any single occurrence of a successful attempt to reproduce accurately a part deleted from a message, deciding from the context that remains what the missing part should be.

A cloze test consists of a passage of about 250 words from which words are omitted at fixed intervals. In administering the test the subjects are first given

the whole passage to read carefully; and then after sometime they are given the test and asked to fill in the gaps appropriately. The degree of comprehension is the extent to which the subjects can replace the omissions correctly. The higher the score of the correct responses, the greater the readability of the passage.

The present study focused on whether cloze tests can serve as valid and reliable measures of readability of textbooks written in Marathi. The study was limited to Classes III to VIII. In all, 739 students from these classes from a representative school in Pune were selected.

Four passages in the story form from old textbooks were selected on which four multiple-choice tests and four cloze tests were constructed and administered to the students.

After the statistical analysis of the scores obtained from both the tests it was concluded that the cloze tests can replace the conventional multiple-choice tests and they are also valid and reliable measures of readability. Therefore, the textbooks in Marathi should be assessed by the cloze tests at the pre-publication stage.



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## Research Notes

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### *Adolescents' School Adjustment : The Effect of Family Climate*

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A CHILD who comes to school, does not bring with him only his physique but also the whole milieu of his socio-psychological characteristics which he acquires in the family through close interactions with parents, sibling and other relations. Well-adjusted family relations and normal attitude of parents give the child an assurance of stability, security, emotional maturity and ability to adjust to new or unforeseen circumstances. But advancement in education, increased crisis of status, rapidly changed structure and culture of the family and society have made him or her overburdened and unbalanced. In school, where mutual relations are mainly formal and are based on factual level put the student into a strange situation affecting his level of school adjustment. Though the school plays a significant role in generating the right kind of behaviour and in solving the problems

of mal-adjustment. Yet it has been found less influential than home (Francis et al. 1934, Lehner and Kube 1955). Basically, the school problems of the child/adolescent have their roots in, and deep connections with, the home problems (Mehta 1969, Feldhausen et al., 1973, Lavoic - Looft 1978, Garg 1978). Contrary to it, Majumdar (1972), Tiwari (1977), Gupta (1978), etc. reported that the physical environment of a school is also influential in the child's school/class adjustment. Besides this, various psychologists and social scientists observed that intelligence (Korani 1973, Pandit 1973, Das 1975) and socio-economic status (Coster 1958) are also significant predictors of school adjustment.

Therefore, in order to arrive at somewhat more meaningful, reliable and valid conclusions regarding the relationship between family climate and school adjustment variables, the researcher has used a more rigorous design in the present study.

#### DESIGN OF THE STUDY

In order to measure the effect of family climate on school adjustment, two variables, SES and intelligence, were controlled with the help of matched group design and to categorise the sample subjects into urban/rural and boys/girls categories locality and sex variables were used. On the basis of the family climate scores, the sample subjects were divided into two categories—(i) highly satisfactory family climate (HSFC) and (ii) highly dissatisfactory family climate (HDFC). Thus, the design of this study turned out to be  $2 \times 2 \times 2$  factorial design with unequal cases in each cell.

#### HYPOTHESES

As the study was designed to be exploratory, the following null hypotheses were formulated:

1. Statistically, there is no significant difference between the adolescents of HSFC and HDFC regarding their school adjustment.
2. No significant variation exists between HSFC and HDFC adolescents in respect to their level of school adjustment on controlling SES, intelligence, sex and locality either individually or altogether.

#### SAMPLE AND SAMPLING TECHNIQUE

The students of Class IX of Garhwal (India), in the age-group 14-17 years, constituted the population of this study. Keeping in view the objectives of this study as well as the huge size of the population, the multi-stage random sampling technique was adopted. Initially, two (Pauri and Tehri) out of five districts (Chamoli, Uttarkashi, Pauri, Tehri and Dehradun) were chosen with the help of the lottery method. These two districts have 238 institutions of high school and intermediate

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levels for boys and girls which are situated both in rural and urban areas. Out of these 238 schools 12 schools (six from each district—three from urban and three from rural areas) were chosen randomly. At the final stage, 1000 adolescents (District—Pauri, N=575, Boys=390; Girls=185 and Tehri district, N=425, Boys=290; Girls=135) of the age-group 14-17 years, were drawn randomly from these 12 schools.

### MEASUREMENT

As per the needs of this study, the following socio-psychological tests were used to collect the data:

1. Family Climate Scale (FCS) — By Dr M.P. Uniyal and Dr Beena Shah
2. Socio-Economic Status Scale (SES) — By Dr Beena Shah
3. Intelligence Test (IT) — By Dr G. Ahuja
4. Adjustment Inventory (AI) — By Dr Beena Shah and Dr Anshu

### TEST ADMINISTRATION AND STATISTICAL TREATMENT

Firstly, FCS along with Personal Data Schedule was administered to the 1000 sample subjects. With the help of Quartile Deviation, the students having highly satisfactory family climate (HSFC, above  $Q_3$ , N = 250) and highly dissatisfactory family climate (HDFC, below  $Q_1$ , N = 250) were identified. Then to control IQ and SES, the students of average intelligence of HSFC and HDFC were matched on SES by using the group-matching technique. The students of HSFC and HDFC groups were compared with the help of 't' test. To collect the data, the remaining three measurements (SES, IT and AI) were administered to only 500 adolescents (HSFC = 250 and HDFC = 250) with an interval of 15-20 days, in order to eliminate the influence of interference and memorization.

### RESULTS AND DISCUSSION

TABLE 1  
Means SAS of Adolescents having HSFC/HDFC

Adolescents	N	M	SD	t
HSFC	250	14.92	4.45	4.50**
HDFC	250	16.72	4.70	

SAS — School Adjustment Scores

\*\* —  $P < 0.01$

It is interesting to note that the students coming from dissatisfactory family climate have shown significantly better adjustment in schools as compared to the students having satisfactory family climate ( $t = 4.50$ ,  $P = .001$ ).



TABLE 2  
Mean SAS of Adolescents having HSFC/HDFC

Adolescents	Variable Controlled	HSFC			HDFC			t
		N	M	SD	N	M	SD	
Total	SES and IQ	223	16.41	4.52	188	15.37	4.65	2.53*
Boys	Sex	180	16.46	4.58	165	14.91	4.81	2.24*
Girls	Sex	70	14.28	4.47	85	15.75	4.45	2.02*
Urban	Locality	140	15.29	4.85	115	17.24	4.51	3.36**
Rural	Locality	110	14.68	4.01	135	15.64	4.62	1.74

\* $P < 0.05$

An examination of Table 2 clearly shows that even after controlling SES and intelligence, family climate was found significantly effective in determining the school adjustment of the adolescents. But contrary to it, a positive relationship was yielded between family climate and school adjustment. This shows that although SES and intelligence were influential determinants of school adjustment, yet the effect of family climate was more pronounced than these variables.

Further, on controlling the sex, when the adolescents of HSFC and HDFC were compared, contradictory findings were obtained. In the case of boys, those who belonged to HSFC were found better adjusted than those of poor climate homes ( $t = 2.24$ ,  $P = .05$ ). On the other hand, in the case of girls, a significant but inverse relationship was obtained between family climate and school adjustment ( $t = 2.02$ ,  $P = .05$ ). Similarly, on controlling locality, the finding of significant but inverse relationship (reported in Table 1) between family climate and school adjustment was consistent for urban adolescents ( $t = 3.36$ ,  $P = .01$ ) while in the case of rural adolescents, the sharpness of variation in the level of school adjustment was diminished altogether between HSFC and HDFC ( $t = 1.74$ , n.s.).

TABLE 3  
Mean SAS of Adolescents of HSFC/HDFC  
(Controlled SES, IQ and Sex/Locality)

Adolescents	HSFC			HDFC			r	t
	N	M	SD	N	M	SD		
Boys	165	15.96	4.91	139	16.52	4.79	0.51	1.16
Girls	68	18.87	4.50	49	20.96	4.90	0.37	2.45*
Urban	123	17.58	4.88	89	15.50	4.80	0.45	3.46**
Rural	100	14.80	4.08	99	15.88	4.48	0.32	1.89

Table 3 shows that on controlling SES and intelligence along with locality or sex, some interesting findings were yielded. In the case of rural as well as girl

adolescents, the findings were consistent with the above results (mentioned in Table 2). While, among boys, the sharpness in variation between HSFC and HDFC groups was diminished altogether ( $t = 1.16$ , n.s.), in the case of urban adolescents, positive and significant relationship between school adjustment and family climate was obtained ( $t = 3.46$ ,  $P = .01$ ).

TABLE 4  
Mean SAS of Adolescents of HSFC/HDFC  
(Controlled SES, IQ, Sex and Locality)

Adolescents	HSFC			HDFC			r	t
	N	M	SD	N	M	SD		
Urban Boys	90	15.15	4.90	51	14.96	4.90	0.42	0.24
Urban Girls	33	13.71	3.26	38	16.44	3.90	0.38	3.84**
Rural Boys	75	16.37	5.07	88	16.02	4.35	0.36	0.50
Rural Girls	25	14.10	4.80	11	16.30	5.70	0.25	1.15

A study of Table 4 reveals that when the level of school adjustment of the adolescents of HSFC and HDFC was compared on controlling SES, IQ, sex and locality, no significant variation was obtained for urban boys ( $t = 0.24$ , n.s.), rural boys ( $t = 0.50$ , n.s.) and rural girls ( $t = 1.15$ , n.s.). On the contrary, a significant variation was found in the case of urban girls ( $t = 3.84$ ,  $P = .01$ ). Here, again, the girls of HDFC had reflected better adjustment as compared to those of HSFC groups.

Thus, on studying the effect of family climate on the school adjustment of the adolescents, inconsistent findings were yielded. In view of the mean school adjustment scores, the comparison between the adolescents of HSFC and HDFC yielded a significant variation. Here, the adolescents of HDFC category were found better adjusted. However, on controlling SES, IQ, locality (urban) and sex (boys), the comparison of the said groups showed significant variation. However, in these cases, the nature of association between family climate and school adjustment was positive. This clearly infers that in deciding one's level of school adjustment, the role of family climate is much more influential as compared to SES, IQ, locality and sex variables. This indicates that in the case of total adolescents (without controlling any variable) HDFC adolescents were found better adjusted than HSFC adolescents. Perhaps, the cause of better school adjustment among the adolescents having highly dissatisfactory family climate may be that those who got rejection from their parents received recognition and affectionate behaviour from their teachers and colleagues which had ultimately raised their level of school adjustment. The finding of better school adjustment of adolescents having dissatisfactory family climate homes was again confirmed when the analysis was carried out for girls after controlling all the variables—SES, IQ, locality, and sex together

(Table 4, for urban girls  $t = 3.84$ ,  $P = .01$ , Table 3, for girls  $t = 2.45$ ,  $P = .05$ ).

Thus due to parental harassment, the female adolescents did not have the opportunities to show their keen interest in various activities at the home, while in the school, the same group of adolescents received due encouragement from their teachers and peers, which has reflected more favourable attitude in them towards their teachers and school than the boys and which ultimately raised sharply their level of school adjustment. In brief, the attentive and affectionate behaviour of teachers (Symonds 1949) and their personality (Francis and Filmore 1934) enhance their adjustment in school. Further, the present finding is also consistent with that of Baldwin et al. (1975) that dominant atmosphere of home showed better school adjustment. This clearly shows that in the case of girls, along with the same family climate, other variables are more responsible for their school adjustment than SES, IQ and locality.

No significant variation between the adolescents of HSFC and HDFC of rural community was observed whether the variables SES, IQ and sex (Table 3) are controlled or not (Table 2). It may be perhaps because the adolescents (both boys and girls) who belonged to highly satisfactory family climate had higher expectations from the school, e.g. facility of playground, well-equipped laboratory and good condition of library (Manchanda, 1952) but the schools of rural areas failed to provide them these facilities. This breaking of expectations create the problem of mal-adjustment among these adolescents. On the other hand, the students who came from highly dissatisfactory family climate received personal attention from their teachers due to weak strength of students in the class which had ultimately reflected a slight increase in their school adjustment. Thus in the case of rural schools, it has been observed that school adjustment of dissatisfactory family climate adolescents rose to certain extent and, on the contrary, it was lowered among the adolescents of satisfactory family climate. This is the reason why the sharpness of variation between the adolescents having satisfactory or dissatisfactory family climate was diminished and they became almost similar in respect to their level of adjustment in the school. (This discussion indicates that the school adjustment of rural adolescents was not remarkably influenced by their family climate. This finding finds support from the investigators (Majumdar 1972, Tiwari 1977, Gupta 1978). These researchers reported that the physical and psychological environment of a school/college is more influential than parent-child relationship in determining one's level of school adjustment.) A similar finding was reported by Spaulding (1964) who said that the most significant cause of better school adjustment was the teacher's personality. This finding is again confirmed in this study. In the case of urban boys, the adolescents of HSFC had shown significantly better school adjustment than those of HDFC. It is because in urban areas schools are usually over-crowded and it is not possible for the teachers to pay personal attention on every individual. Here the boys of HDFC also felt neglected by their teachers and thus showed problems of mal-adjustment at the school.)

In brief, the study arrived at the following conclusions :

1. The relationship between family climate and school adjustment is positive but family climate is less influential in the presence of other relevant variables (SES, IQ, sex, locality and school).
2. In the case of rural adolescents (both boys and girls), family climate is not effective in their school adjustment whether SES, IQ, sex, and locality were controlled or varied.
3. In the case of urban adolescents, a negative and significant association was yielded between family climate and school adjustment (on controlling or not controlling the variables—SES and IQ). This association was remarkably diminished as soon as sex and locality were also controlled along with SES, and IQ. But in the case of urban girls, again, family climate had shown paramount influence on school adjustment.
4. The cumulative influence of the variables—SES, intelligence, sex, and locality—was found to be more prominent in determining one's level of school adjustment rather than the singular influence of family climate.

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### *Factors Affecting Intelligence*

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**T**REMENDOUS research work has been advanced to study the factors that affect intelligence. But no concrete solution has so far been found to resolve the controversies underlying the factors. There are some questions which can be posed to the researches:

- (i) Are intelligence and learning closely related to development?
- (ii) Are I.Q., parental income, age and academic achievement interrelated to each other (Yadav, 1986, 87)?

- (iii) Does a child learn to develop a range of skills which enable him to adapt with his environment?
- (iv) Is I.Q. fixed from birth?
- (v) Does one need to identify certain inadequacies in measures of intelligence?
- (vi) Are I.Q. tests a kind of academic achievement?

The issue of the factors that affect intelligence is of utmost significance. One can further ask certain questions like: What determines the competence of people? Is this fixed and immutable at birth or does it goes on changing with time and circumstances? If so, what circumstances foster maximum growth and development? Simon (1971) maintained that these questions are of immense educational, social and political significance. For instance, if intelligence was fixed from birth, few factors could be incorporated to alter it, and as such the teacher might decide that only brilliant children should be taught (a poor interpretation of streaming). Likewise, a social worker might infer that there was little profit in trying to improve the lot of inadequate family/ies. In the same manner, a politician might best decide that it was pointless investing millions of rupees on pre-schooling and at worst decide to sterilize the subnormal (i.e eugenic and genetic engineering).

However, the basic question with which one is confronted, time and again, is whether intelligence is a genetic endowment or whether it can be nurtured over a time period. These arguments, according to Anastasi (1958), were really stressing mechanisms or factors which play a significant role inside or outside of a human being (body+CNS+brain). The factors which are especially used in such a debate can be tested as below.

#### FACTORS USED IN NATURE AND NURTURE DEBATE

The factors that affect inside and outside world of an individual are given here, though they do not share identical meanings (Pyle, 1979).

Factors Inside	Factors Outside
Nature	Nurture
Heredity	Environment
Genetics	Psycho-social
Biological	Cultural
Maturation	Learning
Urges from within	Urges from without

Henson and Eysenk maintained that IQ scores are 80 per cent determined by inside factors whereas 20 per cent estimated by outside factors. If this is correct, it is really a poor interpretation and shows pessimistic outlook of an individual's

interpretation. Many researchers have contended that both types of factors are constantly interacting with each other, i.e. one set of factors causing a change in the another and vice versa (Pyle, 1979). There are many reviews of such factors, e.g. Vernon 1969, 1976 a and 1976 b) Rutter and Madge, 1976; Pilling and Pringle, 1978).

The issue has been taken for debate for two reasons:

- (i) theoretical controversies (disagreement), and
- (ii) poor evidence and interpretation furnished to support the claims.

The objective of this study was to furnish a mechanism as to how one factor affects the other, e.g. suppose there are factors -A, --- x, y and z. A may affect the operation of X, y and z and x, y and z may bring a change in A, and so on.

#### FACTORS ON INSIDE WORLD, GENETICS AND MATURATION

According to genetic theory, when a child is conceived, the male egg (sperm) releases twenty-three tiny particles and these join twenty-three minute particles released by the female egg (ovum). These forty-six particles, called chromosomes, constitute all the chemical information, which the father and the mother pass on to their child genetically. Little snake-like formations along each chromosome form essentially the basis of inheritance, i.e. heredity. As the baby grows, the cells of the body divide and multiply. In every cell of the body, the genes on chromosomes exercise control over the processes of growth and development, e.g. extent of growth, rate, timing, etc. (Pyle, 1979).

Genes exercise control over growth and development in a variety of ways. For instance, some genes (individually or collectively) determine hair, eye colour, skin pigment and some specific diseases. Other types of genes, working polygenetically (i.e. collectively), do not attain any specific characteristic, but determine a general trend of growth and development. Thus genes work for intelligence in two ways: (i) general way and (ii) specific way. However, one does not inherit genes which determine on their own characteristics, e.g. musical ability, football skills, family ability or more specifically speaking intelligence. Callaway (1970) pointed out that genes can determine the level of skill beyond which one cannot develop. Thus genes do provide the basis for skills, if one desires one's potential for development in certain way. But a researcher should always keep in mind that genes operate in conjunction with environmental factors which determine total characteristics belonging to abilities and skills of an individual. This is the point which signifies the role of interaction of environment with genetics factors in the process of development of intelligence. Li (1971) pointed out that there was one important component in intelligence which was supposed to be inheriting from parents. But it can be altered and as such it is not completely pre-programmed. Heredity can set upper limits in the development of intelligence. However, much

depends on the factors that operate in the environment of an individual and these decide the (i) direction of development and (ii) levels of development of intelligence finally reached.

As one reaches maturity, these genetic programmes (activities) begin to unfold, e.g. with the onset of puberty genetic activities begin to take place and likewise the process of growth. Generally, maturation is considered to be under genetic control, yet the environmental factors are equally important to exert some effect upon maturation. It has also been observed that the onset of puberty is getting earlier and earlier in the successive generation.

The evidence in support of genetic influence on intelligence can be traced from the studies advanced from such areas of research: (i) Race studies and (ii) twin studies. Race studies indicated that black children (Negro) were found to be scoring 15 points lower on intelligence test than their white peers of the same age (Bysenck, 1971). This was interpreted that the lower I.Q. of black children was because of inferior academic environment. However, Jensen (1969) reopened a longstanding controversy by contending that the I.Q. of black children was lower because of the inferior genes which they (black children) inherited from their parents. Jensen (1969) furnished three arguments as regards the black-white controversy: (i) Black children in the USA scores, on the average, lower on the I.Q. tests than their white peers (a quite significant difference). (ii) The individual differences in I.Q. among any groups of children are determined, in part, by genetic factors (this is a sensible point and acceptable to most). He contended that these observed differences are 80 per cent determined by genetic differences (a point which is not acceptable to all). (iii) He further argues that if I.Q. is determined to this high degree by genetic factors, the black-white I.Q. difference is due to genetic factors. However, the arguments and counter-arguments furnished in favour of 80 per cent genetic contribution to the I.Q. points, were not accepted by majority of researchers working in the field and as such even termed as poor interpretation of intelligence.

Erlenmeyer et al. (1963) pointed out that the closest relationship between two people showed similarity in their I.Q. For instance, identical twins had I.Q. scores which were highly correlated (usually very matching scores). The reason behind this seemed to be that 'twins' possess identical genes because they resulted from the splitting of one cell. Likewise, fraternal twins (resulting from two cells) had I.Q. scores quite highly correlated; brother and sisters of different age-groups had scores highly correlated; and parents and their children shared fairly similar I.Q. scores. On the contrary, child and stranger scores were hardly correlated at all.

Another argument in support of similarity in I.Q. scores could be furnished from the twin studies. Accordingly, they (twins) had similar I.Q. because they were reared in similar environment. Still, there are studies which indicated that the twins who were reared in two homes separately, had similar I.Q. These differences in environments again showed similarity in I.Q. Burt's (1976) major studies in this



field were used by Jenson who developed a genetic line of arguments for calculating "heritability coefficients". But Burt's studies did not seem to be reported in an intellectually honest way (Pyle, 1979). Kamin (1974) reviewed the literature on inheritance and revealed that there existed no data which could lead a man to accept the hypothesis that I.Q. scores were, to any degree, heritable.

Hence a review of the related literature reveals that genetic factors do contribute to intelligence but environmental factors are equally important in the development of individual's intellects and skills.

## BIOLOGICAL FACTORS

### (i) *Age of the Mother*

Davie et al. (1972) reported that there are certain factors, both 'inside' and 'outside', which affect intelligence, although they do not appear in the picture directly. Both pre-natal and peri-natal conditions have been reported to affect the development of intelligence. The first factor in this regard is the age of the mother. In the case of ladies ranging between the age of 21 to 35 years, the rate of infant mortality is lower, whereas in the case of the ladies less than twenty and over 35 years, the rate of infant mortality is higher. In such case, the children, if live, undergo mental retardedness. Clarke and Clarke (1974) contended that if all the ladies give birth to the children before the age of thirty-eight, the rate (incidence) of mongolism (mental backwardness) gets reduced.

### (ii) *Diet*

The diet of the mother plays a significant part in the development of intelligence. Recent studies (Dobbing and Smart, 1974; Lewin, 1975) show that the brain follows a spurt of growth of neurons three months before the birth and 18 months or so after the birth. Hence, any deficiency in the food may cause irreparable damage in the development of the brain. After the completion of two years, food deficiency cannot affect greatly the potential of the brain. However, before two years of age very good arrangement of diet of both the mother and the infant should be made for the growth of the brain of the infant.

### (iii) *Side Factors*

There are a number of factors which affect the development of intelligence, e.g. disease during pregnancy, drinking, smoking, drug-taking in pregnancy, (e.g. measles or rubella), abnormal delivery, length of pregnancy, and so on. These factors are part and parcel of biological as well as environmental factors and as such operate together in the environment. They affect intelligence. It is, therefore, concluded that there is need of interpretation of outside factors affecting intelligence

because hereditary and environmental factors cannot be separated completely.

#### FACTORS ON THE OUTSIDE

There are a number of factors which operate in the outside world of the baby. They are equally important in shaping intelligence. These factors may be classified as:

- (i) Social and cultural factors
- (ii) Family and home background
- (iii) Schooling
- (iv) Other factors (i.e. cognitive factors).

#### *Social and Cultural Factors*

A number of aspects of human life are related to the social class. A classification based on father's occupation by Registrar General's classification system was made: (i) the highest social class I and (ii) the lowest social class V. It was observed that the children of unskilled manual workers scored less well on measures of basic school subjects and skills, e.g. number spelling, ability, creativity, adjustment etc. The difference in performance between Class I and V was found to be significant and seemed to increase as children got older (Davie et al., 1972, Wedge and Proseer, 1973; Forgelman and Goldstein, 1976). These differences can be due to the poor reading ability of the children of Class V. One more significant conclusion could be drawn. There was significant difference in the I.Q. of the children of these different classes, yet there was whole range of I.Q. within each class. Uzgis (1970) reported that this issue of intelligence was interpreted in terms of social disadvantage with a related deprived environment; and, therefore, the children concerned are not matured sufficiently with optimal amount and proper experiences. The issue was debated extensively by Cole and Bruner (1971) and Rutter and Madge (1976). Finally, many studies indicated that the concept of psychological lack (deficit) was not as clear as it seemed.

Social class is only one broad category of the total cultural aspects of the community (Swift, 1968). If one considers the case of rural and urban community, the difference between one community and another is often observed. This again indicates the effect of environment on intelligence. Gordon (1923) pointed out the effect of regional deprivation on intelligence. He examined the I.Q. of two families: 'canal' 'boat' and 'gipsy' in the UK and observed that the I.Q. decreased as the children got older. The effect of this type was termed as 'progressive mental retardation'. Sherman and Key (1982) and Wheeler (1942) conducted research in the USA to study the effect on isolated mountain communities and observed that the I.Q. was significantly below the national norms and again reduced with age. Recently, Lesser et al. (1965) studied the difference in patterns of ability

(verbal, reasoning, number, space) of four ethnic communities—Jewish, Chinese, Negro and Puerto Rican of 6-7 years old and reported considerable variations in the patterns they observed between the ethnic groups. Lesser et al. further reported that the middle class children scored better on each test and these patterns of ability were stable irrespective of a particular social class. In this study, each group showed a different pattern, e.g. low verbal, high space versus high verbal, low space. Along with this, the middle class children seemed to have similar patterns and higher scores all around. All these studies supported the hypothesis that culture can exercise influence on the mental abilities of children.

Wiseman's survey of 1964 in Manchester indicated that such factors as family size, persons per acre, housing conditions, infectious disease, infant mortality affected intelligence within a community. Morris (1966) studied reading ability in Kent city and observed a relationship between reading difficulty and environmental handicap. All these studies revealed that the conditions within a certain community amply affected the measures of intelligence and attainment. It can again be concluded that the children with poor cultural conditions and from lower social background may, on the average, be lower in effective intelligence. Vernon (1969) further made some concluding remarks: (i) There are some genetic variations within each class; (ii) The children of these classes usually get poor pre- and post-natal facilities; (iii) Their parents have not reared them in an academically rich environment.

### *Schooling*

It has been observed in a number of studies that attending school has some effect on the academic achievement and thereby on the I.Q. scores of the children (Yadav, 1986). Vernon (1969) reports that the amount of schooling, regardless of quality, seems to promote the kind of reasoning required in I.Q. scores. Both pre-school education and school education can raise the intellectual powers of the child. Pidgeon (1970) reports that children's intellectual levels can be raised by subtle factors that operate in the school environment. Yadav (1986, 1987) indicates that enriched academic environment can raise the levels of intelligence. Conversely, the subjects who score higher on the intelligence scale, also score higher on the achievement test (Marek, 1981; Yadav, 1986, 87).

Rosenthal and Jacobson (1968) studied the effects of teacher expectations on pupil's performance. But the children, selected at random, eventually made significant gains as compared to their peers. In spite of serious faults in this study, the researchers such as Williams (1976) accepted the validity of the findings and this was further termed as the principle of self-fulfilling prophecy. This indicates that I.Q. tests cannot measure the potential ability of the children. They can only measure the present levels of intellectual functioning. Hence, I.Q. scores can predict the general levels of intellectual functioning. This controversy may more or less be resolved if one takes into consideration age, academic achievement and

intellectual scores simultaneously, because I.Q. goes on increasing fairly up to the age of adolescence. Hence, enriched academic environment (subtle factors such as effective methods of teaching, physical conditions of the classroom, quality of the content presented, teacher's confidence in teaching, continuous assessment of the students after a week or fortnight and subsequent feedback, home assignment and supervision) may positively raise the levels of intellectual functioning of the growing children (Yadav, 1986, 87, 88).

## INTERACTION VS TRANSACTIONAL APPROACH

Ferguson (1976) reported that differences in ability are due to differences in environmental demands. Jensen further argued that environment works according to some rules such as 'threshold': that is over a period or level of stimulation it ceases to exert any effect and then the differences in I.Q. of people are due to genetic endowment. Clarke and Clarke (1974) further contended that human development was mediated by slow, unfolding, cumulative and powerful biological-sociological interactions.

There is another point of view advocated by Sameroff and Chandler (1975) who identified transactional model of intelligence rather than interactional model. The proponents of this view argued that an interactional model was inadequate to resolve inside-outside factors because they were no longer constant over time. Everybody's ideas, attitude and personality characteristics change in the environment and as such do affect intellectual functioning. Thus a more dynamic theory of transactions is required to ascertain the factors that account for changing circumstances. This further lays emphasis on the plastic nature of intelligence and as such the environment in which an individual is active to his own development. This view holds that a child does not make responses to his surrounding world in an inactive manner, but actively operates upon his environment, organizes and reorganizes it and finally gives shapes to his own experiences. Hence, the transactional model of intelligence seems to be rearing a cognitive view of intellectual development. The arguments and counter-arguments, then lead to two significant themes: (i) the importance of early experiences in the cognitive development, and (ii) constancy of an individual's I.Q. over time. It would further follow from the above that if the intelligent behaviour of a child is determined by the continuous interactions and transactions of the genes and environmental conditions, then both genetic and environmental factors and the models explaining interaction and transaction are equally important in affecting the intelligence of the child. The significant conclusion of the above debate is that each individual should be extended optimal growing and learning conditions during early years of development. Furthermore, it is important to design and conduct early screening procedures to identify the children at risk and to provide them the best support (nourishment) and academic environment in order to ensure them optimal learning and development.

Marek (1981) reported that I.Q., academic achievement, cognitive development and inquiry skills were positively correlated with each other. Yadav (1986, 87) reported that I.Q., academic achievement and parental income of the children (age-group 12-16 years) were positively correlated with each other. It has further been concluded that negative correlationship between age and I.Q. represented lack in nourishment of the child. Hence there is constant need to rear the children properly and to further provide them good academic environment so as to accelerate their rate of learning (Yadav 1986, 87).

### IMPORTANT CONCLUSIONS

Based on the review of related literature, the following conclusions could be drawn about the factors that affect intelligence:

1. In every cell of the body, genes or chromosomes exercise control on the processes of growth and development. Thus genes work on intelligence in a number of ways: (i) some genes individually or collectively determine eye colour, hair, skin pigment and some specific diseases; (ii) other genes working polegenetically do not determine any specific characteristics, but general trend of growth and development and (iii) genes can determine the level of skills beyond which one cannot develop. However, one cannot inherit genes which determine such specific characteristics as: musical ability, football skills, family abilities, etc.
2. It is heritability that sets the upper limit in the development of intelligence (Li, 1971). However, much relies upon the factors that operate in the environment of an individual and these decide (i) the direction of development and (ii) levels of development finally reached.
3. Race studies indicated that black children scored 15 points lower on the measures of intelligence than their white peers. Intelligence was termed as the ability of an individual being contributed 80 per cent by heritability and 20 per cent by environmental factors (Jenson, 1969).
4. Genetic factors make significant contribution to the development of intelligence but environmental factors are equally important in the growth and development of an individual's intellect and skills.
5. Age of the mother is a significant factor. The rate of child mortality in ladies ranging between the age-group of 21 years to 35 years, is low than in ladies below 21 and above 35 years. Children, if live, generally undergo mental retardedness (Davies et al. 1972, Clarke and Clark, 1974).
6. Generally, the brain follows spurt of growth of neurons three months before the birth and 18 months after the birth. Hence any deficiency

- in food may cause irreparable loss in the development of intelligence. After the age of two years, food deficiency may not affect the brain growth and intelligence (Drobbing and Smart, 1974; Lewin, 1975).
7. Side factors such as disease during pregnancy, drinking, smoking and drug-taking in pregnancy (measles and rubella), abnormal delivery, length of delivery, etc. may affect intelligence.
  8. Culture can exercise influence on the mental abilities of the children. For example, such factors as family size, persons per acre, housing conditions, infectious diseases, infant mortality affected intelligence (Wiseman, 1964). A family size increases, intelligence goes on decreasing in the case of children born at later stage.
  9. Pre-schooling and schooling education both raise the levels of intelligence. Hence enriched academic environment such as use of better methods of teaching, quality of the content, guidance, motivation, home assignment, supervision and continuous feedback after regular intervals and physical conditions of the school may raise the levels of learning and intelligence (Yadav, 1986, 87).
  10. Transactional model of intelligence reveals that a child does not make responses to his surrounding environment in a passive manner, but he actively operates upon his environment, organizes and reorganizes and finally gives shape to his experiences. Hence the transactional model seems to be rearing the view of cognitive development. However, Piaget's theory of intellectual development holds that learning takes place at identifiable stages of development successively.

Thus, there are a number of factors that affect intelligence. Some factors have been identified here which play a significant role in the development of intelligence. However, some research hypotheses are posed for researchers to seek answers:

1. Eighty per cent contribution of heritability and 20 per cent contribution of environment lead to difference in the academic achievement of the children. Can intelligence be raised by providing enriched academic environment to the children?
2. Difference in the I.Q. of different races seems to be due to two factors: (i) difference in academic environment, and (ii) difference in the genetic potentiality of the parents. Which of these factors affects intelligence more?
3. If difference in the I.Q. of Black negroes and whites is due to genetic potentiality, then it is really poor interpretation of intelligence.

It is, therefore, proposed that researches be conducted under much more controlled conditions through field experimentation to resolve racial controversy on account of both intelligence and learning.

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## ***Achievement Motivation and Parental Behaviour : A Critique of Researches***

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**A** STUDY of achievement motivation would not be complete without some attempt to understand its origin. How is it that some students score high and some low? Are they simply born that way? Or, are the differences in scores simply temporary, reflecting momentary differences in the life situation of the individual concerned? We can accept neither of these view if our theoretical analysis of motivation is correct. It has been argued that all motives are learned, they develop out of repeated affective experiences connected with certain types of situations and types of behaviours. In the case of achievement motivation, the situation should involve a standard of excellence, presumably imposed on the child by the culture, or more particularly by the parents as representatives of the culture. It follows, thus, that those cultures or families which stress competition with standard of excellence or which insist that the child should be able to perform certain tasks well by himself, should produce children with high achievement motivation. To state the same issue negatively, if a family does not set high standard of excellence, or if it does not permit the child to compete, then he could not be expected to have the affective experiences connected with meeting or failing to meet achievement standards, which cumulatively produce an achievement motive. Taking this as a basic premise, some studies conducted in this area are presented below:

McClelland et al (1953) studied the effect of perceived parent behaviour on n-achievement scores of male college students. Sons who perceived their fathers as having rejected them had higher n-achievement scores than the sons whose fathers loved and accepted them. Since these results would not have been predicted by McClelland's theory, the study was again conducted, but on the high school males. The result for high school males was the reverse of that of college males. McClelland attempted to explain these results by stating that the reversal in perceived parental behaviour was not a function of change in behaviour, but a change in sons' perception of the behaviour. What might have been a friendly act in high school could well be perceived as unfriendly and interfering act in college. Nevertheless, the perception of parent behaviour was found to have a marked relationship with n-achievement.

A good deal of research has stemmed from the relationship of independence training and n-achievement. Winterbottom (1958) investigated mother's attitude towards independence training and n-achievement. Her results indicated that high n-achievement subjects had earlier independence training than lows; that mothers of high n-achievement subjects decreased restrictions at the age of eight while mothers of low continued to increase restrictions at this age; and that mothers, who use physical rewards (kiss or hug) for achievement success, have sons with higher n-Ach scores than mothers who do not use physical rewards. Her data were considered to adapt well to the affect arousal model.

Several informative studies have been conducted utilizing over- and under-achieving high school students as the motivational measure. Morrow and Wilson (1961) investigated the family relations of 48 high school boys of superior intelligence who were making high grades compared with those of a group with comparable intelligence, but making poor grades. They found that parents of bright high achievers engaged in more sharing of activities, ideas and confidence, were more approving and encouraging with respect to achievement and were less restrictive, the reverse was true for the underachievers. On the same lines, Norman (1966) administered the Gordon Survey of Interpersonal Values to parents of achievers and non-achievers. He found that fathers of achieving boys and mothers of achieving girls made significantly higher mean scores in independence and lower mean scores in conformity than did the same sex parents of non-achievers.

Rosen and D'Andreade (1959) investigated origins of achievement motivation by creating an experimental situation through which they could measure the parents' response to their sons, while they were engaged in an achievement situation. Their control included age, race, IQ, social class and sex. They found that mothers of high n-Ach boys were more dominant, yet expected less self-reliance than mothers of lows. High n-Ach boys were observed to have more autonomy from the father than from the mother. Mothers of high n-Ach subjects exhibited more warmth than mothers of lows. Yet, mothers of high n-Ach were more inclined to punish their sons for failure by rejection.

Studies by Hayashi et al (1962) in Japan, observed no significant differences between the high n-Ach (HA) and low n-Ach (LA) groups. They assumed that n-Ach scores shown by children would reflect the degree in which parents demand their children to behave independently. This may be due to several reasons. But they stated that the cultural differences are more important factors to bring about this fact. They argued that at high school ages Japanese parents give their children less independence training than American parents.

Another study by Hayashi and Yamauchi (1964) indicated the following fact as the most important point. The LM (mothers of low motivation children) are apt to mingle strict and indulgent attitudes. In other words, there is no consistency in their training. They concluded that the difference in training attitude between American and Japanese mothers is determined by social and cultural dif-

ferences. According to their opinion, deep-rooted feudalistic thought remains in Japan and this thought has an effect on Japanese mothers' way of thinking about home discipline.

Katz (1967) found evidence of great variation in the concept of success for adolescents of different socio-economic classes. He differentiated his subjects according to their fathers' occupation and found that white collar students defined success in terms of status achievement by personal effort and worth, while unskilled classes' subjects were not concerned with status but with attaining possessions.

In the studies cited so far, extreme groups of students with high and low motivation, as determined by TAT measures or other criteria (under and over achievement in school) have been compared with respect to the differences in parents' child-rearing practices. Although the findings are intricate and at times appear to be contradictory because of the disparity in theoretical formulations and methods, some convergence is obvious. Feld (1960) re-examined Winterbottom's students, six years later. The achievement motivation of the 14 to 16 years of boys correlated negatively with the values that mothers placed on independence in their sons at this age level. Evidently, the attitude of mothers reversed itself for the older school level. Furthermore, it is notable that the failure anxiety of sons at this age level was related to the absence of early self-reliance training and to a correspondingly lower level of achievement motivation during the first year of school.

The family as a small group structure may also contain influence which further or hinder the development of strong achievement motivation. Both orders of siblings, size of the family, the intactness of the home have been shown to be important (Atkinson and Millar, 1956). In cultures like India and Japan, it is rather the younger, the youngest children who are highly motivated (McClelland, 1961). The influence of family size on the achievement motivation of boys varies with social class (Rosen, 1961). In the upper classes, medium size families produce boys with highest scores whereas in the middle class, the smaller the family the larger the score. Broken homes or weak ties between parents hinder the development of achievement motivation. Veroff (1960) found this to be true for men in his representative sample of the United States' population.

The family attitudes which impinge on general competence were examined in an extensive study of nursery school children (Beumrind and Black, 1967). In this study, competent children were identified as mature, realistic, curious, sociable, assertive, self-reliant and able to exert effective self-control. The mothers of such children were clear and firm in their demands for excellence in their children's performance. They were also clear and direct in their verbal interaction with children. Above all, they were nurturing and supportive.

According to social learning theory, the child learns that some of his behaviours are pleasing to parents and receive their obvious approval. This approval

of others acquires strong positive reinforcement value. The child learns that many of his responses which please him are considered inappropriate by the others. He will incur parental disapproval or punishment for these and begins to learn what is expected of him and how to meet these expectations. Thus the child generally learns to behave in a social way, acceptable to his significant others (Sullivan, 1947).

Generally speaking, the male model influences more strongly the behaviour of boys than the female model influences the behaviour of girls (Rosenblith, 1959; Gray, 1959). However, the degree of influence is partially determined by the age of the child. Also, there are complicated same sex and cross-sex influences between parent and child which vary according to a specific kind of role under consideration. Research findings are conflicting, but they do show agreement in pointing out the important role of both parents as socializers and models for their children.

Even before the child starts school he is an astute observer, noting the behaviour and interest of his parents. Many of these interests he will begin to internalise on his own. He will be developing motivation to achieve success in activities which are valued by his parents. Since he, in the past, was a self-decider, his achievement behaviour will also indicate those areas of activity in which success will give him approval of self.

Mothers and fathers who value intellectual attainment for themselves value this for their children too. Those parental values relate closely to the intellectual achievement values of daughters but not sons (Katkovasky, 1964). This might be because parents and children regard school work at the elementary level, especially reading, as a feminine kind of activities, perhaps because boys are expected to be more physically expressive and active at this age.

Crandall (1964) focussed on this point in the following words:

"The attitude which parents hold about their own personal achievement, effect their attitudes towards their children's achievements and influence their own behaviour with their children, in achievement activities".

The relationship of the parents to each other will have an effect on the child as he grows. The child has need for love, acceptance and consistency. The greater the affection and acceptance a parent has for his child, the more he is apt to attribute his own positive characteristics to his child but not his negative ones. The rejecting parent, on the other hand, may be prone to project his own negative qualities to his child to a greater extent than his positive qualities.

In India, Gokulnathan and Mehta (1972) studied the tribals of Assam. They found that tribal low EL boys (i.e. fathers with low education) showed significantly greater n-Ach than non-tribal low EL boys. Within tribal and non-tribal groups, neither father's education, nor occupation, nor income showed significant relationship with children's n-Achievement.

Mehta (1974) in her study of socio-cultural stratification of need achievement in three linguistic groups—Sindi, Punjabi and Hindi— arrived at the following conclusions:

Sindhi and Punjabi boys were higher in level of need achievement than boys in the Hindi linguistic group. Within the family setting of these groups, the following factors were observed:

- Mothers' standards of age in training for independence and mastery,
- Achievement-related value orientation of mothers, and
- Mothers' mode of ethical education.

The mode of reward and punishment was not observed as a factor effecting the origin of achievement motivation.

Mehta (1969) found that the socio-economic status of pupils as such was not significantly related to n-achievement. However, significant trends appeared when father's educational level and occupational group were considered separately. Both these factors in pupils' home background showed significant relationship. Father's income did not show such relationship. Children whose fathers were in professional and semi-professional groups showed higher level of n-Ach than children whose fathers were from other groups. The children of small shopkeepers were at the lowest level. The difference between n-Ach of children of skilled workers and those of shopkeepers was quite significant. Within the lower middle class group, education showed positive relationship with n-Ach. On the other hand, children of skilled workers with low education, showed significantly greater n-Ach than those of lower middle class fathers with low education.

Srivastava and Tiwari (1967) in their study found middle class subjects scoring higher on n-Ach than upper class subjects who in turn were found superior to lower class subjects.

In the Gujarat study, Desai (1970) found that father's composite SES (Socio-Economic Status) did not show significant relationship with children's n-Ach. Chaudhary (1971) found SES to be positively related with n-Ach.

De and Priya (1972) in a study of family factors observed that a significant relationship exists between birth order and achievement motivation. First born have high achievement motivation than later born. A positive correlation was found between education of parents and n-Ach of children. The first and the only born child has high n-Ach than the middle or later born children.

Pandharipande (1977) found the class and caste difference in n-Ach. Mean scores for n-Ach were higher for middle class as compared to lower class. The higher caste students were having high n-Ach than the lower caste students. The parents of the high n-Ach group were less rewarding less punishing and were imposing fewer restrictions. The contemporary practices of parents in terms of independence and achievement training were found to be more relevant to n-Ach development than the past practices.

Sahoo and Panda (1982) observed that no relationship exists between socio-economic status and achievement motivation. Dave and Dave (1972) in a study of risk-taking in a game of pure chance found that social perception, parental income, education, occupation and ordinal position of birth have no relationship with the risk-taking behaviour of the students. Lyngdoh (1976) found that students who had low family influence were not afraid of failure than those who had high family influence. Between the high and average family influence groups, the occupational aspirations were of the same magnitude. The occupational aspirations of those students who had low family influence were low. Mubayi (1976) found that the number of siblings in the family, birth order of the pupils, vocational aspiration of the pupils, educational level of the father, motivation towards school, pupils' perception of achievement demand by their peers, perception of achievement demand by fathers and educational level of father, were not found to be related to achievement motivation.

Naik (1978) undertook an exhaustive study to understand the phenomena of achievement motivation in family settings in Indian conditions. He studied achievement motivation in two entrepreneurial groups of Gujarat. One was Jain community and the other was Anavil Brahmins. Both these communities have excelled the other communities in the field of trade, business and have occupied control and key positions in public as well as in private sectors.

He selected 400 students of ninth grade from both the sexes belonging to these two communities and studied the n-Ach level of students in various socio-economic backgrounds including the place of residence (rural-urban). A family influence inventory was developed in order to assess the parental behaviour of these two communities. He also undertook indepth case studies of some selected cases and came out with the following conclusions:

- ✓ No statistically significant difference was found in the n-Ach scores of students belonging to rural and urban areas of these two communities.
- ✓ However, the trend was in favour of urban students.
- No statistically significant difference was observed in the n-Ach levels of students of these communities in different socio-economic status.
- No sex difference was observed in Anavils and Jains in their n-Ach levels.
- No difference in family influence was observed in Jain and Anavil communities. In Anavil families, the parents' expectation level was found to be influencing the n-Ach level of students. He also found that in Anavil families' parents' goal identification process, parents' motivational level, parents' supportive behaviour had direct influence on the achievement motive acquisition of the child.
- Highly significant differences were observed in the case of Jain communities among high n-Ach and low n-Ach pupils in terms of family influence. The parents' expectation, parents' goal identification, parents'

motivational level, parents' supportive behaviour and parents' goal identification process were found to have significant influence on the achievement motive acquisition in the children.

It was further observed that the socio-economic status of the family has bearing on the n-Ach level of children, provided it is coupled with family influences. The high level of family influence was found associated with the high socio-economic status. The students belonging to the high SES group were possessing high n-Ach level only when their family influence was high. This was found true in both these communities.

### CONCLUDING REMARKS

The studies cited so far in the area of achievement motivation have shown various trends. Most of the studies conducted in this area in the Indian context are correlational. Some of the trends that are being observed in these studies are given hereunder:

1. The result of the studies pertaining to psychological variables, in general, and personality variables, in particular, differ from culture to culture. Even within the same culture the trend of the findings is fluctuating when different sub-cultures are taken into account.
2. The studies conducted in the deprived communities with special reference to tribal communities have not considered the sociological and anthropological aspect of the children. Most of those studies have focussed on the relationships of some psychological variables with achievement motivation.
3. The studies conducted on the sociological dimension of achievement motivation are very less. Mostly, these studies have focussed on the status variables like SES or some infrastructural variables of the family, like family type, family size, siblings, birth order, etc., and their direct or indirect effect on achievement motivation. These studies appear to have ignored some of the mediating interactional variables such as parent-child interactions, practices and patterns followed by the parents in rearing and socialising their children. For example, parent's education may be a variable affecting the child's achievement motivation, but the process through which it actually operates may be the interaction the children had with the parents at home. Thus, mere assessment of a variable may not be a sufficient index of the processes involved. An attempt is needed in this direction to ascertain the process variables operating in influencing achievement motivation. Hence, there exists a gap in the studies, to be researched upon, in order to understand the phenomena of achievement motivation in totality.

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### ***Concept Attainment Model and Inductive Thinking Model of Teaching : Effect on Achievement, Self-concept and Attitude Towards Science***

NARESH KUMAR GUPTA

**M**ODELS of teaching has been one of the most neglected areas of research as studies in the field are almost negligible and the methodology followed by almost all the investigators in the same. A small number of investigations which studied the strategies of teaching are generally the researches concerning the studies of methods of teaching school subjects. Researches concerning the fundamental

work on Models of Teaching or strategies to be developed and followed by the teachers are woefully lacking. There were no studies reported in the Third Survey of Educational Research in India on Models of Teaching. However, a few studies have been reported in some journals.

With the induction of Models of Teaching by Joyce and Weil (1980), Bredy (1985), Gage (1979, Stallings (1977), Mosstons (1972), Lapp, et. al. (1975) a new dimension to the approach of teaching has been opened. We should agree with Joyce and Weil (1985) that there is a great need for research which examines the dimensions of the instructional and nurturant effects of various models. Moreover, educational research will have to identify eventually, those few models of teaching which are most efficient and effective.

Admittingly, it is very difficult to compare many kinds of models because they approach the goals so differently. Evidence in respect of relative effectiveness of these two models (concept attainment model and inductive thinking model) on the acquisition of science concepts is found wanting. The two models were selected because they were applicable, functional and workable in Indian situation in our classrooms with greater ease. These two models were from the same family with nearly similar patterns, similar goals and similar strategies. They were easy to handle with a wide applicability across the subjects. They were inductive in nature and drawn from the actual tasks developed in classroom situation. Both enriched and clarified known concepts and were graded equally moderate on the classification of models by the amount of structure and appropriate conceptual levels. Thus seeing the need of the time, the need of the discipline, the Indian classroom situation, the objectives and nature of these models, it was felt desirable to carry out a comparative study of the effectiveness of Concept Attainment Model (Bruner et. al) and Inductive Thinking Model (Hilda Taba) on the criteria like achievement, self-concept and attitude towards science.

## OBJECTIVES

The following were the objectives of the study :

1. To design and develop an instructional plan on the teaching of selected units in physics at Class IX level, based on the Concept Attainment Model and the Inductive Thinking Model.
2. To study the effectiveness of teaching through the Concept Attainment Model on (i) pupils' achievement, (ii) pupils' self-concept, and (iii) their attitude towards science.
3. To study the effectiveness of teaching through the Inductive Thinking Model on (i) pupils' achievement, (ii) pupils' self-concept, and (iii) their attitude towards science.
4. To find the relative effectiveness of teaching through the Concept Attainment Model and the Inductive Thinking Model on the achievement of students.

5. To find the relative effectiveness of teaching through the Concept Attainment Model and the Inductive Thinking model on the attitude of pupils towards science.
6. To find the relative effectiveness of teaching through the Concept Attainment Model and the Inductive Thinking Model on the self-concept of pupils.

#### DESIGN OF THE STUDY

Experimental method was employed using two groups, for the study with pre-test, post-test design. A sample of 64 students of Class IX was selected for experimentation. In a natural setting, two different sections of the same Class IX were taken up for experiment. The two groups were controlled in respect of age, sex, physical conditions, etc. The groups were tested on self-concept, attitude towards science and mental ability before the commencement of the treatment.

The groups were, then, subjected to the treatment: Group A was taught through the Concept Attainment Model, while Group B through the Inductive Thinking Model.

After the treatment, the post-test was conducted to assess the effect of the treatment on the criterion variables achievement, self-concept and attitude towards science through the criteria tests. The tools used were: Jalota's General Mental Ability Test for mental ability; The Science Attitude Scale by Avinash Grewal for attitude towards science and Self-concept questionnaire by R.K. Saraswat for obtaining scores on the self-concept achievement test was, however, developed by the investigator himself to test the achievement of the subjects.

For analysis of the data, t-ratio, analysis of variance and analysis of co-variance were employed. The effectiveness of the individual model was judged on achievement, self-concept and attitude towards science. A comparison of the effect of the two models on these variables was also undertaken through ANOVA and ANCOVA.

#### FINDINGS AND CONCLUSIONS

The following were the major findings of the study :

1. Hilda Taba's Inductive Thinking Model was found more effective than the Concept Attainment Model when compared on achievement.
2. The Concept Attainment Model of teaching was not effective in promoting attitude towards science.
3. Hilda Taba's Inductive Thinking Model was effective in promoting attitude towards science.
4. Hilda Taba's Inductive Thinking Model of teaching was found superior to the Concept Attainment Model in promoting attitude towards science.

5. Neither the Concept Attainment Model nor Hilda Taba's Inductive Thinking Model was effective in bringing about significant changes in self-concept.

#### EDUCATIONAL IMPLICATIONS

The present study has several implications for all those who have interest in research and innovation in the field of science teaching, in particular, and teaching, in general. So it can be said to have implications for teachers, teacher-educators, administrators and research workers. It will be worthwhile to present some of such implications here:

1. Models of teaching need to be introduced for teaching of science as they have significant effect on bringing about desirable changes in the students along with better learning.
2. Equality of learning opportunity can be a goal of education rather than equality of learning outcomes. Such a goal suggests that teachers must find ways of giving each child the help and encouragement he needs. Learning environments must be created during teaching. It may involve some extra expenditure which will help in achieving the results.
3. Teachers need to be trained in the Models of Teaching, specially the Concept Attainment Model and the Inductive Thinking Model, so that they are able to develop tasks in their subjects according to these models.
4. Teachers also need to be trained in application of these models according to the need in their classrooms. Only appropriate strategy at right hour is most effective.
5. The models of teaching are easily applicable in Indian classrooms because they are based on no other technology except the technology of developing instructional materials and indigenous organisational models for providing alternative instructional channels within our existing classroom and school structure.
6. "Science for ALL" needs an important strategy of teaching to be developed to ensure learning of the total instruction by all the pupils. The models of teaching are alternate forms to "Learning by Doing" or "Child-centred Approach", as the students are encouraged to evolve the whole lesson. The models of teaching are interactive and participatory in approach.
7. In a mixed class, consisting of all the students with different conceptual styles, preferences, Hilda Taba's Inductive Thinking Model may be preferably employed for teaching science lessons.

8. The models of teaching as a theory-cum-practice programme could be integrated into methods of teaching various subjects at training courses.
9. Teacher Education programme in India should incorporate training for variety of models of teaching so that tomorrow's teachers are more rational and flexible in selection and use of a teaching strategy suitable to pupils and their needs. The implementability of these models of teaching is experimentally tried and field tested.

#### SUGGESTIONS FOR FURTHER RESEARCH

Based on the experience of the researcher, the following suggestions are made for future researches in the area of Models of Teaching :

1. A long-term experimental study, of at least one academic session duration, may be planned on the same lines and design, to study the effects of these models on the criteria variables studied herein.
2. The study may be replicated for various grade levels and for different topics in physics to test the generalisation of the results and conclusions of this study.
3. Research may be conducted to test the workability and feasibility of various models of teaching in the Indian classroom situations.
4. Researches could also be conducted on the efficacy of various models of teaching, so that certain modifications may be brought about in them.
5. The nurturant effects of the Concept Attainment Model and the Inductive Thinking Model could be studied along with their instructional effects.
6. Perceptual changes in the students, on being taught through these models of teaching, may be worked out and studied, using different scales.
7. Attainment of the objectives of science may be studied through these two models of teaching.
8. Different models of teaching can be analysed in terms of specific teaching and training skills.
9. Curriculum in various subjects may be evolved through studies on the lines of these models of teaching specially Hilda Taba's Inductive Thinking Model.
10. The models can be tested and validated with the help of variables of different domains, viz. cognitive, affective and psycho-motor domains.
11. The teacher behaviour under these two strategies could be analysed from the transcripts of the lessons taken through these two strategies.
12. Possibilities of replacing the methods of teaching by models of teaching may be worked out.

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## ***Student-teachers, Teaching Profession and Manpower Planning***

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**T**HERE have been many professions in our country available for every young-man and woman, which they may choose after graduation and post-graduation. There has been a tendency amongst youngmen and women to prefer administrative, executive and other lucrative services. Those who fail to achieve these they try to get jobs from amongst other employment opportunities accessible to them. There is hardly a consideration for one's interest and aptitude. This leads to an increasing number of misfits on the jobs. Teacher education is no more exception to it. For various reasons the teaching profession is usually a last choice for the young generation. It is only recently that persons with good qualifications are entering the teaching profession. But for success as a teacher only academic qualifications cannot serve as the sole criterion. Persons with undecided mind and anxiety cannot deliver goods whatever profession they join (Sharma, 1984).

It is well known that the number of secondary teacher education institutions has increased manifold in the country after independence. The reason for such expansion is that the number of candidates seeking admission to secondary teacher education institutions has increased. Selection of the right type of candidates is pre-requisite for the successful and effective implementation of a teacher education programme. Therefore it is essential to select such persons for professional training who could become good teachers.

Recently, the Uttar Pradesh Government has made admission test policy for admission to the B.Ed. course at the State universities and the Colleges affiliated to these universities. Chauhan (1983) and Sharma (1984) conducted studies to

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find out the factors responsible for selecting teaching as a career. These studies were conducted before the implementation of the admission test policy. The present study was undertaken in the light of above-mentioned investigations.

### OBJECTIVES

The following were the objectives of this study:

1. To find out the reasons for seeking admission to the B.Ed. course.
2. To explore the relationship of sex and reasons.
3. To find out the effect of marital status on the attitudes of male and female students vis-a-vis the teaching profession.
4. To examine the impact of economic status on the choice of teaching profession.
5. To study the relationship between age and reasons
6. To study the impact of area (rural and urban) on the choice of the teaching profession.

### DESIGN OF THE STUDY

#### *Method*

Normative survey method and cross-sectional approach were employed for conducting the present investigations.

#### *Sample*

The sample consisted of 291 student-teachers (144 male, 147 female) pursuing their B.Ed. degree course in the constituent and affiliated college of Hemvati Nandan Bahuguna Garhwal University, Srinagar (Garhwal) during the session 1987-88. The cluster random sampling technique was employed.

#### *Instrument Used*

A Hindi version of the Attitude Scale constructed by Chauhan (1983) was used for this study.

### ANALYSIS AND INTERPRETATION OF DATA

The data were analysed to study the relationship of seven factors namely—sex, age, education, marital status, income and area.

#### *Sex vs Income*

Two groups of male and female students were compared on three income groups,



i.e. Below, Middle and High. The value of chi-square for these two groups is ( $\chi^2=29.267$ ,  $df = 2$ ,  $>.001$ ). This implies that the null hypothesis stands rejected. These two groups did not come from the same population. To know whether these two groups differed significantly at each item, further probing was done by considering  $2 \times 5$  contingency tables.

- (i) *Sex*: When two groups of male and female students were compared on each item, it was found that these two groups differed significantly on item 3 (B.Ed. admission test was of an ordinary standard and it had several errors), item 7 (I tried to get admission in Ph.D. but I could not get success. Therefore, I took admission in B.Ed.), item 8 (I took admission in B.Ed., because I may get job when I am in need), item 9 (I am in an urgent need of job because my financial condition is very poor. Therefore, I took admission in B.Ed. so that I may get job in short period), item No. 20 (I want to become a teacher because society has regard for a teacher. Therefore I am doing B.Ed.). The table below shows the value of chi-square for these items:

$$(\chi^2 = 10.02, df = 4, > .05) \quad (\chi^2 = 12.68, df = 4, > .01)$$

$$(\chi^2 = 29.32, df = 4, > .001) \quad (\chi^2 = 30.24, df = 4, > .001)$$

$$(\chi^2 = 9.85, df = 4, > .05).$$

It reveals that these two groups differ in their opinion on these items.

- (ii) *Income*: When three groups of High, Medium and Low income groups were compared on each item, it was found that these groups differed significantly on item 3 ( $\chi^2 = 28.994$ ,  $df = 8, 7.001$ ), Item 4 (I am overage for any other government service. Therefore I took admission in B.Ed.) ( $\chi^2 = 19.16$ ,  $df = 8$ ,  $> .01$ ), Item 5 (Without this training I was not able to get promotion. Therefore, it was necessary for me to do B.Ed.) ( $\chi^2 = 17.114$ ,  $df = 8$ ,  $> .05$ ), Item 8 (I took admission in B.Ed. to pass time. I was not in much need of it) ( $\chi^2 = 36.397$ ,  $df = 8$ ,  $> .001$ ), Item 9 ( $\chi^2 = 22.309$ ,  $df = 8$ ,  $> .01$ ), Item 10 (My interest is in teaching. Therefore I took admission in B.Ed. So that I may become a teacher) ( $\chi^2 = 33.75$ ,  $df = 8$ ,  $> .001$ ), Item 13 (I took admission in B.Ed. to fulfil my husband/wife's desire. I was not interested in it) ( $\chi^2 = 15.363$ ,  $df = 8$ ,  $> .05$ ), Item 15 (I was not interested but my parents insisted me to take admission in B.Ed.) ( $\chi^2 = 17.274$ ,  $df = 8$ ,  $> .05$ ), Item 16 (Teaching profession is an honest and less corrupt profession), Item 20 ( $\chi^2 = 15.497$ ,  $df = 8$ ,  $> .05$ ).
- (iii) *Age*: Two groups of students up to 24 years and above 24 years were compared. It was found that these two groups differed significantly on item 2 (I could not get any job despite my best efforts. Therefore I took admission in B.Ed.) ( $\chi^2 = 22.368$ ,  $df = 4$ ,  $> .001$ ) and item 4 ( $\chi^2 = 38.992$ ,  $df = 4$ ,  $> .001$ ).

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- (iv) *Education*: When two groups of graduate and post-graduate students were compared, it was found that these two groups differed significantly on item 2 ( $\chi^2 = 22.368$ ,  $df = 14$ ,  $> .001$ ). They did not differ on the rest of the items.
- (v) *Marital Status*: When two groups of unmarried and married students were compared, they differed significantly on item 4 ( $\chi^2 = 12.864$ ,  $df = 4$ ,  $> .01$ ), Item 16 ( $\chi^2 = 10.266$ ,  $df = 4$ ,  $> .05$ ), and Item 20 ( $\chi^2 = 11.469$ ,  $df = 4$ ,  $> .05$ ).
- (vi) *Area*: When two groups of urban and rural students were compared, they differed on item 1 (I took admission in B.Ed. because I will get a job in a school after completing this training and it will become a source of my livelihood) ( $\chi^2 = 10.268$ ,  $df = 4$ ,  $> .05$ ), Item 2 ( $\chi^2 = 12.429$ ,  $df = 4$ ,  $> .01$ ), Item 3 ( $\chi^2 = 11.237$ ,  $df = 4$ ,  $> .05$ ), Item 4 ( $\chi^2 = 12.356$ ,  $df = 4$ ,  $> .05$ ), Item 9 ( $\chi^2 = 13.36$ ,  $df = 4$ ,  $> .01$ ), Item 10 ( $\chi^2 = 17.03$ ,  $df = 4$ ,  $> .01$ ), Item 14 (I will get good bride/bridegroom) ( $\chi^2 = 10.434$ ,  $df = 4$ ,  $> .05$ ), Item 16 ( $\chi^2 = 32.59$ ,  $df = 4$ ,  $> .001$ ), Item 18 (My educational qualifications are good. Persons with good qualifications should join teaching profession. Therefore I took admission in B.Ed.) ( $\chi^2 = 19.528$ ,  $df = 4$ ,  $> .001$ ), Item 20 ( $\chi^2 = 11.502$ ,  $df = 4$ ,  $> .05$ ), Item 17 (My parents can give less dowry in my marriage. Therefore I am doing B.Ed.) and item 19 (I am doing B.Ed. so that my parents will get more dowry in my marriage). These two statements were for only one group, i.e. either for males or females. Therefore these items were not comparable.

## CONCLUSION

The above analysis revealed two main factors—immediate solution for employment and to pass spare time—which motivate students to take admission in B.Ed. A similar finding was reported by Chauhan (1983) and Sharina (1984). Other factors responsible for their inclination towards the teaching profession were: interest in the teaching profession, insistence by their parents or life-partner. This finding is supported by Sharma (1984). The students also felt that since the admission test for B.Ed. was of an ordinary standard, they got selected for the course.

It is clear from the data that students with middle and low economic status take up the teaching profession because they feel an urgent need for employment to support their family. Therefore, there should be a proper manpower planning so that the unemployment problem of trained teachers be minimised.

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## Book Reviews

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### Manpower Planning

#### Education and Manpower Planning

Devender Thakur (ed.), Deep & Deep Publications, 1990, pp.491, Rs 425.00

**T**HE present publication is divided into five parts and contains forty-one chapters. It also has bibliography and index. The titles of the sections are Primary and Secondary Education; Higher Education; Adult Education and Mass Literacy; Evaluation Technique; and Principles of Education in Indian Constitution. One is hard put to find any relationship between the title and the content of the book. It looks as if the editor has taken more trouble in the collection of write-ups than in their actual content. There is not a single chapter on the manpower planning aspect. It would appear that the editor has at the last minute thought of giving title to an assortment of essays to suit the requirements of his job at the College of Management or, worse, the publishers had the bright idea of what sells in education.

Needless to say, there is neither any coherence in the subject matter selected nor are the chapters of quality. The introduction and the bibliography which the editor himself must have taken pains to prepare are excellent examples of his scholarship and industry. Besides the language which does not communicate, even

the spellings of proper nouns vary from one section to another. He perhaps had no design of his own and does not seem to know the authors of the chapters, otherwise he would have mentioned their institutional association, etc. It would be too uncharitable to present an analysis of what the chapters themselves purport to say. How does India plan education or what type of autonomy do India's universities have or could we find an ideal construct in a social-political system which on its own verges on anarchy are questions which part two of the book should have attempted. In their place we have chapters whose authors betray familiarity with the subject matter itself.

The production of the publication is good and the price even better. This book should be read by all those who want to know how a quickie is produced.

R.P. SINGH

## Mental Health

### Social Stress and Mental Health

Ajita Chakraborty, Sage Publications, New Delhi, 1990, pp.200, Rs 185.00

THE present study belongs to the area of social-psychiatry discussing primarily mental health in relation to industrialisation and urbanisation. The is limited to Calcutta and its surrounding area but, if taken in a wider perspective, the findings and conclusions should not be so restricted. True, Calcutta, like Bombay, suffers from over-population, migration and economic hardships but in several respects it is a unique metropolis—or at least so is the opinion of many a people.

The author discusses several Western and Indian studies and has attempted to remove several common misunderstandings. For instance, a common belief that rural setting is conducive to tension-free living is as untenable as that Agra or

Lucknow has less of mental health problems than Calcutta. Migration of population appears to lead to this kind of stress more than any other factor.

The principle aim of the study was:

To find confirmation of the generally held premises that

- (a) poverty and urban stresses were causing extensive mental health problems in Calcutta, and
- (b) the number of chronically ill persons in the Community at large must be high because there are no large mental health hospitals in the State.

After training the team how to elicit response, the author followed survey method exactly on the same lines as any Westerner would. The author uses the Indian Psychiatric Interview schedule, on two-stage stratified basis. The stratification was based on economic status. Family reports were prepared on a family schedule.

In other words, all care was taken to make the study as scientific and proper as possible.

A few findings are:

- The rate for abnormal personality and paranoid state was 12/1000 of the adult sample population.
- Psychosis rates seem to rise steadily with advancing age, but fall off at the age of 60 years and above. This association was significant.
- The rates were higher for females at all age levels, with the exception of the age-group 14-24 years.
- The peak periods for psychosis, etc. were 50-59 years for males and 40-49 years for females. Age had a positive correlation, both for men and women, to mental health problems.

The present volume contains illustrative histories and an essay by Dr B. Sandel titled "An indepth Study of Neurosis among Women in Calcutta" (with special reference to life events).

The most important observation of the author pertains to utilization of the results of the study. She sadly remarks: "Though the aim was fulfilled as far as we are concerned, it is doubtful whether planners will ever take any notice of it". Isn't this the case of most of research findings?

An excellent work, neatly presented and beautifully produced.

NEERJA SHUKLA

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## Occupational Therapy Educational Standards in India: A Case and Field Study

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INDIA has more than 800 million people and one of the largest number of medical colleges and universities in the world (Beauchamp, 1986). Despite this wealth of medical schools, the All India Occupational Therapy Association (AIOTA) has achieved accreditation for only four occupational therapy (OT) educational programmes through the World Federation of Occupational Therapy (WFOT). Although there are several other programmes that profess to be OT schools, these programmes are not accredited by WFOT (Nimbkat, 1980, 1983; Purohit, 1983, 1987; WFOT, 1985). The Federation is the authoritative body which grants official international educational accreditation to OT professional education programmes worldwide. A school that receives this accreditation is recognized as having met

minimal educational standards. Students graduating from WFOT-accredited schools are recognized internationally as qualified to practice in OT worldwide.

Occupational therapy is a health discipline "concerned with people who are physically and/or mentally impaired, disable, and/or handicapped, either temporarily or permanently. The [therapist] involves the patients in activities designed to promote the restoration and maximum use of independent function with the aim of helping such people to meet the demands of their working, social, and domestic environment, and to participate in life ... to its fullest" (WFOT, 1985, p. 2).

The need for qualified OT graduates in India from WFOT-accredited schools has more than doubled in the past decade (Hopkins, 1987; Purohit, 1987). Since 1969, Indian medical schools have been unable to develop WFOT-accredited OT programmes to meet these demands (WFOT, 1986). As a result of the shortage of accredited OT educational programmes, India is faced with a manpower shortage for the increasing consumer demand of OT services.

Another major problem confronting OT education in India is the need to advance the competitiveness and sophistication of their current professional training syllabi. An equally critical issue is maintaining accreditation of the four existing schools, as well as developing additional WFOT-recognized schools. Those additional educational programmes would help provide more qualified practitioners, as well as improve quality health care provided by occupational therapists in India.

The reason for this lack of development was unclear to AIOTA, WFOT, India's Medical Council (IMC), and the World Health Organization (WHO). An important question asked by these organizations was, "What factors affect the ability of India to develop additional WFOT-accredited schools?" Another critical question was, "What variables affect quality of care delivered to patients by professional occupational therapists in India?"

This paper is a brief summary of extensive ethnographic and field analyses, which included information from a currently WFOT-accredited educational programme and identification of agencies directly affecting the education and service of OT in India. An examination of these factors has provided insights for answers to the above-noted questions.

## METHODOLOGY

### *Subjects*

This study identified six key organizations/agencies that affect change in the OT syllabi and direct service of occupational therapists in India:

1. World Health Organization (WHO)
2. Indian Medical Council (IMC)

3. Indian Rehabilitation Council (IRC)
4. World Federation of Occupation Therapy (WFOT)
5. All India Occupational Therapy Association (AIOTA)
6. Health Ministries of India

The Christian Medical College Hospital (CMCH), a WFOT-accredited OT educational programme, was analyzed as the case study portion of this investigation.

### *Apparatus*

This study utilized non-experimental ethnographic research methods. All six of the above-mentioned organizations, agencies, and political officials, affecting the services and education of occupational therapists, were sampled using on-site interviews and programme analysis.

Specific apparatus and techniques used for the case and field studies were as follows:

*Analysis of WFOT vs AIOTA Standards and Analysis of AIOTA.* Data collection methods included observations, interviews, and document analysis. A multifaceted approach to the analysis of AIOTA's "Minimum Educational Standards" compared to the Federation's standards was used. A written evaluation tool, combining the official WFOT standards and a Self-Study Check-List (SSCL) model (Kohler, 1989), was designed and applied to allow both a quantitative and qualitative investigation of programme practice and discrepancies (SSCL available through Editor).

*Analysis of WFOT vs CMCH Standards.* The WFOT minimum standards, combined with the SSCL analysis and on-site interviews, were applied.

*Analysis of AIOTA vs CMCH Standards.* The AIOTA "Minimum Educational Standards" were compared to the CMCH professional OT educational syllabi using a modified SSCL.

### *Procedure*

The WFOT "Minimum Educational Standards" were secured from the Federation's Educational Chair (Concha, 1988, 1989, 1990). A Self-Study Check-List (SSCL) was designed at the University of Montana, Missoula, Montana, USA, before the on-site analysis. Likewise, prefatory literature reviews regarding AIOTA, IMC, and WHO were completed at the University of Montana prior to the field study. The CMCH OT educational programme was reviewed in the USA using documents collected during the researcher's previous on-site project in 1985 (Kohler, 1985, 1988a, 1989).

From June to September 1987 on-site interviews with the AIOTA Executive Board in Bombay and document reviews of the Association were completed. On-site literature reviews and analyses at CMCH and the University of Madras were

also completed (NCERT, 1971; UGC, 1986; Zachariah, 1968). Twenty-eight practicing OTs, representing the states of Karnataka, Kerala, Tamil Nadu, Andhra Pradesh, and Maharashtra, were interviewed during this time.

Results of the CMCH accreditation review were given to the faculty in September 1989. Syllabus planning and teacher training workshops were conducted following presentation of the review results (Kohler, 1987, 1989). Syllabi revisions as a result of the analysis were submitted to the University of Madras in January 1990 (Hopkins, 1990).

Results of the analysis of WFOT-AIOTA and WFOT-CMCH, in addition to the organization/agency investigations were presented to AIOTA via written correspondence in November 1987. These results were also presented to the WFOT Education Committee in Sintra, Portugal, September 1988 (Kohler, 1988b).

## RESULTS

### *Variables Affecting India's Ability to Develop Additional WFOT-accredited Schools*

Analysis of the data revealed the following factors affecting India's ability to develop additional WFOT-accredited schools. Judgements regarding compliance and various discrepancies are not the official position of WFOT or AIOTA, but those of the researcher.

**WFOT vs AIOTA Standards.** The "Minimum Educational Standards" of AIOTA compared to WFOT's exceeded the Federation standards in the area of academic degree by offering a Bachelor of Science in Occupational Therapy (B.Sc.). All four of India's schools now offer a bachelor's degree. Additionally, one programme offers a Master of Science in OT. Other comparisons showed significant deficiencies in both number of course hours and subject content of the B.Sc. professional programme syllabi. Specifically, areas of deficit were work-study, social-industrial legislation, organization-administration training, and inadequate faculty skills in teaching, supervision, and problem-solving strategies.

**Analysis of AIOTA.** The data gathered concerning the OT association provided information regarding the function and status of AIOTA. In sum, the Association's lack of legal authority within the medical and educational systems has caused it to remain only a "representative body" of occupational therapists in India.

Problems of financial instability, disunity regarding ethical issues, and membership beliefs of biased representation have been major issues in the lack of devel-

opment of AIOTA. However, the Association continues to strive toward improved political relations, financial stability, and membership satisfaction.

*CMCH vs WFOT and AIOTA Standards.* The school exceeded standards of the Federation and AIOTA in almost all credit hour and content areas. Weaknesses were evident in the syllabi in the areas of work study, social-industrial legislation, development and management of OT programmes, and overall problem-solving course strategies.

*Organizations and Agencies.* WFOT has been unable to provide effective educational consultation services for developing countries like India because of financial limitations and multiple social system variables. Occupational therapy as a professional is still in its infancy in India. Organizations such as WHO, IMC, IRC, and the Health Ministries are only beginning to recognize the field as a profession with a valuable health-care service.

These organizations are key change agents in the process of assisting India's ability to develop additional WFOT-accredited schools. However, due to AIOTA's lack of political status with IMC, Health Ministries, and the newness of the profession, these key agencies have not given adequate attention to AIOTA, educational programmes, and the OT profession's needs. Other factors such as lack of physician support, referral bases, hospital facilities that provide OT services, and the overall impression that the profession's services are often seen as a "medical luxury" contribute to the inability of developing additional accredited schools (Hopkins, 1987; Purohit, 1987).

#### *Variables Affecting the Quality of Care Delivered by Occupational Therapists in India*

There are no systems to monitor therapists in India. Examinations for students to become practicing professionals are regulated by the degree granting institution and not AIOTA or WFOT. Officials in these institutions often have little knowledge of the skill competencies necessary to practice OT. Therefore, programmes often remain weak in areas that are essential for training therapists in delivery of quality care.

#### DISCUSSION

The results have provided insight into the factors and variables affecting the development of OT educational programmes and health-care delivery in India. Discussion of these results will be briefly presented in the following two sections: (1) Usefulness of the Self-Study Check-List (SSCL), and (2) Educational Implications, Recommendations, and Research Implications.

### *Self-Study Check-List (SSCL)*

SSCL was found to be a useful tool during the on-site research in India, as it provided procedure and content guidance during actual on-site reviews. Sections of SSCL dealing with syllabi were useful in structuring examinations of the AIOTA educational standards and the CMCH syllabi. The format provided a clear comparison between the standard and the programmes.

However, weaknesses in SSCL were noted as the tool did not provide means for detecting subtle cultural and sociological agendas affecting AIOTA and CMCH's written syllabi and actual programmes.

In September 1988, CMCH and the WFOT Education Committee adopted portions of SSCL to assist in future evaluations of curricula/syllabi regarding standards and compliance of OT educational programmes. In January 1990, CMCH completed syllabi revisions based upon SSCL results of their on-site study.

### *Implications and Recommendations*

Some of the factors affecting the ability of India to develop additional WFOT-accredited schools are as follows: (1) lack of authority by AIOTA to monitor/review OT syllabi in India; (2) university accreditation committees do not seek consultation from AIOTA or WFOT regarding OT educational programmes; (3) AIOTA-written guides are non-compliant with WFOT standards; (4) syllabi revisions/reviews are not priority for AIOTA; (5) lack of authority, and no evaluation tools for AIOTA to conduct on-site reviews; (6) no government regulations regarding development of non-WFOT-accredited OT education programmes; (7) lack of qualified instructors with advanced degrees to fill faculty positions in OT schools; (8) the profession of OT is still relatively unknown among physicians in India; and (9) AIOTA has no "active" voting voice of authority on IMC, IRC, Ministry of Health, or University accreditation committees.

The factors affecting the quality of health care delivered to patients by professional occupational therapists in India include (1) AIOTA minimum standards are non-compliant with WFOT in the areas of work-study, social-industrial legislation, organization-administration of OT programmes, and overall problem-solving course strategies. This results in therapists practicing with inadequate skills in the areas of education and treatment regarding disabilities of vocational rehabilitation and work-capacity skills. Likewise, syllabi are weak in areas of training therapists to organize and administer vitally needed OT services in rural areas. (2) Teachers of OT education in India continue to use knowledge-based strategies. Hence, students and practicing therapists are weak in application and problem-solving skills. Likewise, skills in the areas of patient assessment and treatment planning are inadequate. (3) Poorly supervised OT internships cause final-year students to

complete their programmes with inadequate skills to begin competent treatment. (4) Disunity among AIOTA members causes a lack of coordinated efforts in educating other medical professionals, agencies, and public organizations regarding the value of OT services. (5) AIOTA has poor political representation with organizations of authority among health-care professionals in India.

Recommendations to the All India Occupational Therapy Association are as follows: (1) The Association needs to focus on assisting schools in syllabi development and expansion; (2) Development of a periodic syllabi review system with OT schools to monitor compliancy and assist programme expansion is essential; (3) Syllabi should include work-study, social-industrial legislation, organization-management administration, and research writing courses in the guideline requirements; (4) The development of a "written evaluation tool" is needed for reviewing both the written syllabi and on-site programmes; (5) Application to WFOT and WHO for grants to fund needs such as on-site reviews of current accredited schools, training therapists in research methodology, and training faculty in critical thinking teaching strategies is essential; (6) Concentration on training expert OT representatives to interact with agencies of authority regarding health care in India is suggested; (7) Development of strategies to expand public relations programmes for the education of medical professionals, consumers, and the general public regarding the benefits of OT health services is necessary; (8) An appeal to government and university authorities is needed to develop a monitoring system that would restrict schools from offering OT training programmes that are not WFOT-AIOTA accredited.

Recommendations to the World Federation of Occupational Therapy are as follows: (1) a review of AIOTA minimum guidelines is needed to assist the association in monitoring compliancy; (2) Correspondence is needed with the India accreditation systems and government officials to encourage their relationship with AIOTA; (3) Improvement of an active "voice" and written petition with WHO to increase support toward AIOTA regarding both educational and direct service issues is necessary; (4) Provision of funds and expert consultation to the AIOTA executive committee for development of written syllabi assessment tools, resource materials, and on-site review procedures is essential; (5) A study to identify sources for funding/sponsoring Indian OT teacher training, and research/publication activities is suggested; and (6) Development of specialized advanced masters and doctorate programmes in the field of OT to train experts in (a) curriculum development for OT programmes in third-world nations, (b) cross-cultural consultants to assist new OT schools in developing nations expand their programmes, and (c) expert consultants to represent OT in international organizations such as WHO regarding issues of OT services worldwide.

General recommendations to occupational therapy educational programmes in developing nations are as follows: (1) administrative attention toward securing

qualified leadership for OT school programmes; (2) ongoing syllabi revisions; (3) development of an OT training syllabi with specialized course content addressing issues unique to developing nations; (4) examination of "teacher-training" courses in the areas of critical thinking, research methodology, and teaching strategies for OT faculty teaching in developing nations; (5) additional field testing of SSCL; and (6) examination and design of follow-up evaluation tools to monitor ongoing curriculum development after written and on-site analyses are completed.

Occupational therapy is a vital service in promoting improvement of health care worldwide. The advancement of OT curricula and syllabi is a key component in expanding the quality of direct patient treatment.

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## Concept Studies and Language Use: What do Behaviourists and Cognitivists Say?

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**A**NCIENT philosophical psychology "was shaped by the needs of philosophy" wherein "psyche was never altogether neglected" (*Psychology* 1959, p. 588). This grew during the middle ages and influenced thinkers of the Renaissance. Philosophical ideas, as were evident till the mid-nineteenth century, have always nurtured divergences. Basic controversy ranged between two extremes—whether names, meanings, ideas, notions are embodied by objects themselves; or whether perceiving human organism labels names, meanings, ideas, notions to objects—whether concepts are ideally organised; or whether concepts are physically experienced.

### *Progressive Psychology*

Progressive psychology—begun with Hobbes (1588-1679) and matured through Locke (1632-1704)—tried to explain the mechanism of the mind. It viewed that “experience is the only source of knowledge” (Bower and Hilgard 1986, p. 2). This was in tune with the philosophy of Associationism. Nevertheless, the other school of philosophy called Rationalism often criticised this view. One of the proponents of Rationalism, Kant (1724-1804), observed, “Although all our knowledge begins with experience, it by no means follows that it all originates from experience” (1887, p. 1). According to Rationalism, it was the interpretative mechanism of the mind that transformed the sense data, which are basically chaotic and unstructured, into meaningful concepts.

It is interesting to note that the Gestaltists came in accord with the rationalistic criticism against the empirical view of classical Associationism, and believed that it was under certain categorical relational grouping that the amorphous experience data were organised into perceptions.

### *Associationism*

Implications of the time-honoured associationism were developed by Hartley (1705-1757). For him “memories were organised by the coherence of ideas; the ‘cohering’ came to be known as association” (*Psychology* 1959, p. 589). He was rather in search of a physiological psychology and tried to apply ‘laws’ of association to the process of perceiving concepts and ideas in the human mind.

Experimental investigations followed—mainly—into the process of learning. These started with Ebbinghaus (*Memory*, 1885) on human memory, and Thorndike (*Animal Intelligence*, 1899) on animal intelligence.

The theories established by Thorndike (1874-1949) came to be known as Connectionism which tried to posit that ‘bonds’ created between ‘sense impressions’ and ‘responses’ are responsible for strengthening or weakening habit structure.

### *Physiological Psychology*

Wundt (1832-1920) was to establish physiological psychology. “The Wundtian influence ... provided the impetus for new methods in the investigation of mental processes as they appear in consciousness” (*Psychology* 1959, p. 592). Almost about the same time Darwin’s (1859) theory of evolution “made psychology ... a matter of practical movement” (*Behaviourism* 1959, p. 496). Psychology became “functional and thinkers as diverse as Herbert Spencer, John Dewey and William James worked out functional psychology” (*ibid.*, p. 496). Associationism was followed by behaviouristic revolution.

Having been influenced by contemporary findings based on physical principles of 'cause-effect', industrial revolution, inventions of new machines in the middle of the last century, behaviourism became over-energetic in the zeal of making psychology a scientific science in letter and spirit. Notions of consciousness and premises of associationism were rejected.

As such behaviourism became mechanical. Naturally language use was also looked at from the same angle. For, language is necessarily a human behaviour. Language learning was thought to be behaviouristic in nature.

### *Behaviourism—Root*

*Psychology, from the Stand-point of Behaviourism* (1919) by Watson (1878-1958) and *General Psychology in Terms of Behaviour* (Smith and Guthrie, 1921) marked the catalyst of what is known as behaviourism.

Pavlovian (1849-1936) behaviourism and Skinnerian (1964) behaviourism—in terms of S-R learning—are later approximations of Watsonian ideals. It had its root in associationistic theories which include "those of Thorndike, Pavlov, Guthrie, Hull, Skinner and the school of functionalism" (Bower and Hilgard 1986, p. 8). The other way round—behaviourism was improvement upon associationism.

### *Behavioural Psychology*

Behavioural psychology is a "theory of psychology which states that human and animal behaviour can and should be studied in terms of physical process only. It led to theories of learning which explained how an external event (a stimulus) caused a change in the behaviour of an individual (a response) without using concepts like 'mind' or 'ideas', or any kind of mental behaviour" (*Behaviourism* 1985, p. 27). It has been used profusely in psychology, education, language teaching and especially for explaining first language learning. However, it did not show positive concern for explaining the role of concept and conceptualisation in the process of learning. Naturally a reaction was due to this school of psychology for its laying too much emphasis on physical behaviour.

### *The Gestalt School*

The Gestalt school, the origin of cognitive psychology, reacted against behaviouristic principles on the criticism that behaviourism "ignored the vital factor of the organism" (*Behaviourism* 1959, p. 95). According to the school, the formula should be S-O-R, i.e. Stimulus-Organism-Response, instead of S-R, i.e. Stimulus-Response. In the words of Nunn (1949), the doctrine of 'Gestalt Psychologie' is that "the reaction of a living organism to environmental change is never merely a reaction in the sense physical science gives to them, but a response or answer"

(p. 234). The responses "are not merely mechanical ... but are shaped into a pattern conforming with the pattern under which the external situation is cognized" (*ibid.*, p. 234).

### *Gestalt—Root*

The Gestalt school originally a tradition of psychology nurtured by German scholars (vide *The Mentality of Apes* by Kohler, 1925; *Productive Thinking* by Wertheimer, 1959; *The Growth of the Mind* by Koffka, 1924), emphasized that "the perception of form emerged from relationships among the parts of the form and in this process the parts might lose their former properties and take on new properties determined by the form of the whole pattern" (Bower and Hilgard 1985, p. 309).

### *Cognitivism—Root*

Tolman (1886-1959) is considered the first systematist of cognitive theory. He was a behaviourist; but worked on Purposive Behaviourism (vide *Purposive Behaviourism in Animals and Men* 1932).

This indicates that cognitive psychology had its root in behaviourism too. In fact, as the revolutionary fervour of earlier behaviourism faded away and as it became purposive, it merged with the tenets of Gestalt and ultimately emerged projectile under the name of cognitive psychology.

### *Cognitive Psychology*

The cognitive school made notions of Gestalt more explicit. However, as behaviourist psychology got concerned with physical behaviour cognitive psychology got concerned with mental behaviour, rather mental experience. It ventured to find out how human organism cognizes and interprets the world around.

Since the importance of human language was deemed instrumental in cognition, it was imperative for this school of psychology to observe, to define, and to predict the process of cognition in which language acts.

The process, as viewed by this school, may be put in a nutshell thus: First, human organism collects inputs—that are sense experience—from environment. Next, memory is activated to retrieve experience—data. Particular stimuli—cues or association chains—produce or elicit responses. These responses are organised through applying judgement and rationale regarding coherence. As a result, cognition is verbalised or written.

### *Neo-Behaviourism*

The early behaviourists' rejection of 'cognition' was perhaps due to the wrong equation that 'percepts' and 'concepts' are all the same.

It is undeniable that "the sense data gathered from more than one sense organ"—visual, auditory, tactual—"go to build up complete perception of an object" (Mukherjee 1956, p. 47); but it is equally true that object-perception is not enough for cognizing 'abstraction' into concept. The later behaviourists seemed to have realized and overcome this misunderstanding.

Gagne (1965) was the first among the later behaviourists to categorize and place 'concept learning' in a considerably higher order in learning hierarchy although he was convinced "that animals and children solve problems by transfer from previous learning" (p. 16).

In the mid-twentieth century, behaviourists stooped to accept certain tenets of the cognitive school. For example, they voted that 'concepts' were formed by cognitive abstraction. The new strain was coined neo-behaviourism. The most important departure from the earlier trend was their belief that generalisation of experience was a cognitive operation—and the whole story was not merely the production of Stimulus-Response learning.

### *Neo Cognitive School and Concept Studies*

If the late nineteenth century is marked for behaviourists, the early twentieth century for gestaltists, the mid-twentieth century for neo-behaviourists, the period beyond the fifties could be allotted to neo-cognitivists.

Rigid physiological bias of behaviourists was softening and dissolving—siding with the cognitive school became observable; nonetheless, adherence to behaviourism was not lost altogether. Concept formation was classified under a higher order cognitive ability. Thinking was labelled as a symbolic activity of the mind. Concept studies absorbed more focus, compelled more research, and arrested more educationists in terms of cognition and language use. The relationship among concept formation, language acquisition, experience articulation became much easier to read and record. At least one specific notion got established that human language use owes more to concepts formed internally, and that better language use owes most to better organisation of concepts.

### BEHAVIOURIST CANONS

The relative retrospect having been founded, it is time to approach the present objective specifically. At first behaviourist canons should be given a precise indubitable treat.

Thorndike (1874-1949) admitted human 'insight'; but he endeavoured to interpret it in terms of nothing more than laws of association applied in other situation.

He was confident that "nowhere are bonds acquired with old situations more surely revealed in action than when a new situation appears" (1913, p. 29).

Pavlov (1849-1936), the originator of 'classical conditioning', presumed that there could be no "grounds for differentiation, for distinguishing between that which the psychologist calls the temporary connection and that which the psychologist terms association ... They are fully identical; they merge and absorb each other" (1955, p. 251).

Guthrie (1886-1959) never attributed any compliment to 'insight'. He averred that learning depended on 'contiguity' of cue and responses: "A combination of stimuli which was accompanied by a movement will on its recurrence tend to be followed by that movement" (1935, p. 26).

Skinner (1964), the formulator of 'operant conditioning', always rejected all 'mentalistic' or 'cognitive' explanations of human behaviour. Nevertheless, the very concept of 'operant'—organism's tendency to emit unconditioned responses to any stimulus—seems to bear the psyche of 'insight'. He, of course, maintained that 'mentalistic' explanations and postulates were worthless and incomplete.

Like Skinner, Hull (1884-1952) had also shown some departure from physical behaviourism. He was essentially influenced by Pavlovian 'reflexes' and Thorndike's 'law of effect'. Yet he was the first noticeable behaviourist who, with considerable openness, tried to consider and find the role of 'intervening variables' that "mediate between cause and effect within the organism" (Bower and Hilgard 1986, p. 96).

### *Behaviorism—On Relationship between Concept and Language Use*

Since staunch behaviourism was always opposed to the role of cognition in learning, it had very little—hardly anything—to say or reflect on the relationship between concept and language use. Having been preoccupied with the role of S-R, it explored the relationship—whatsoever—in terms of behaviouristic explanation. This is reported below.

Thorndike confided in the bond between an old situation and a new situation; but he failed to explain how past habits operate in solving problems in a new situation. His preoccupation with 'bonds' or 'connection' made him rather deaf to the forming of concept by insight—deaf to the fact that "behaviour is determined by the psychological field consisting of an organised system ... How we perceive an object, for example, is determined by the total field in which the object is embedded" (Hall and Lindzey 1985, p. 383).

According to Pavlov, language system was the 'second signal system'—the 'conditioned reflex system' being the 'first signal system'. He believed that "the fundamental laws governing the activity of the first signalling system must also

govern that of the second, because it too is activity of the same nervous system" (Pavlov 1955, p. 262).

Hull (1943) accepted the role of "intervening variables" in the process of learning. Skinner went further to accept the role of mediating variables. He maintained the firm belief that human organism could be made to "think" or "be creative" (1943, p. 252-256) by manipulating variables—internal or external stimuli—to which emitting desired responses are due.

From the discussion it can be inferred that behaviourism never asserted or supported anything in favour of the process of concept formation as regards learning. Now, language behaviour is a product of learning. If behaviourists had nothing to note of concept formation in learning, they had hardly any vote for the impact of concept formation on language use. This fact has been the issue where behaviourism contradicts cognitivism. For, the latter has always been all out to mind the role of concept formation in language use.

The behaviourists around the fifties and beyond seemed to be breaking off physical behaviourism, as regarding relationship of thinking with language use. For example, Valentine observed: "We cannot discuss the development of thinking without constant reference to the development of language ... Language helps the formation of concepts" (1963, p. 287). The term 'cognition' was explained to be indicative of "all kinds of knowing or awareness—awareness of things, of imagery and ideas, of the thinking of relationship, even awareness of feeling" (*ibid.*, p. 45). At the same time it is astonishing to mark the comment: "It is not, of course, the task of the psychologist to discuss about what are correct concepts; but he is concerned with the process of reaching them" (*ibid.*, p. 281). It is not a contradiction really—rather it speaks of the behaviourist's dilemma, in the fifties, to accept cognitive psychology. As a result, behaviouristic principles were rationalized off and on to give explanation of concept and concept formation. For example, Smith (1962) considered concept formation a resultant behaviour following latent 'trial and error'—"We are able to retain our past experience in the form of ideas. Then, when we meet similar situations in the future, we can reach down into our store of experience and come up with appropriate ideas. And we can manipulate our ideas and in so doing find suitable solutions to even somewhat dissimilar problems. When we learn through manipulating ideas, the familiar pattern of motive-goal-back is still present, but the process may require little or no overt physical activity" (p. 263).

Likewise, concept formation was explained in terms of 'stimulus discrimination' and 'stimulus generalisation'. Another prominent behaviourist principle: "Concept formation requires an organism to develop an understanding, which can be measured by the organism's behaviour; that certain objects, events, or characteristics of a stimulus which have a common element. On the basis of this element



the organism then classifies the phenomena. The actual source of the concept lies in respondent or operant learning. It is the transfer—or generalisation—of what is to other situations sharing common elements that constitutes the formation of concept" (Medinnur and Johnson 1969, p. 21).

## COGNITIVE CANONS

The early twentieth century considered concepts as 'patterns' or 'schemas' (Sturt 1915, p. 246) that were organised mentally but actively. Russell (1961) observed: "We can theoretically collect together a number of particulars which may be defined as the 'aspects' or 'appearances' of one thing at one time" (p. 125). He defined 'mnemic phenomena' as "what transform a biography ... into a life" (*ibid.*, p. 129). "When I look at a star, my sensation is: (1) A member of the group of particulars which is the star and which is associated with the place where the star is; (2) A member of the group of particulars which is my biography, and which is associated with the place where I am" (Russell 1961, p. 129-130).

Seizing upon Gestalt psychology, Koffka (1962) maintained that "the ideational field depends most intimately upon the sensory, and any means that enable us to become independent of immediate perception are rooted in perception, and, in truth, only lead us from one perception to another" (p. 166). He further noted that "it is through ideational learning that man ... attains his mastery over the world" (*ibid.*, p. 339). Thus concepts were thought to be generic and perception or sub-concepts specific. "Universals ... are ... only concepts, while individual particulars are percepts" (Brubacher 1950, p. 37).

Commenting on Jung (1919), Nunn (1949) pointed out "Most of the active concepts or patterns with which our minds are filled have been derived by abstraction from experience" and "our power of seeing and understanding the world depends upon a power to read 'patterns' into it ... In thinking, the mind deals with schemes or concepts cut loose from the things in the perceptual world to which they belong—in a word, with ideas" (p. 223-226).

Piaget (1964) was keen about treating 'cognitive organisation' in course of intellectual development. In his words: "Experience is always necessary for intellectual development ... but ... being submitted to an experience is" not "sufficient for a subject to disengage the structure involved ... The subject must be active, must transform things, and find the structure of his own actions on the objects" (p. 4). Thus he laid stress on the need of organism's motivational factors that would lead to active arousal of cognition. However, a critique's view was that "Piaget seems lukewarm to the idea that experience alone may significantly alter developmental patterns" (Beilin 1968, p. 361).

Flavell (1965), a follower of Piaget, commented: "Cognition, like digestion, is an organised affair ... Intellectual functioning ... is also characterised by the invariant processes of 'assimilation' and 'accommodation' " (p. 46-47).

Towards the beginning of the fifties "the tripartite division of experience into cognition or the knowing experience, affect or the feeling experience, and conation or the striving experience" (Ross 1954, p. 130) was generally accepted by psychology. As a result, the equation that succeeded was that if cognition was equal to "what man knows", there "must be a representation of his major modes of thinking" (*ibid.*, p. 199) such as language.

In recent days cognitive psychology has become an experimental science which has the following four major components to exploit human cognition:

1. 'sensory receptors' that extract inputs from the environment;
2. 'effector units' that produce responses;
3. 'memory store' that holds received data and activates programmes; and
4. 'central processor' that activates behaviourally thought, judgement, logic, reason, decision, and so on.

### *Cognitivism—On Relationship between Concept and Language Use*

Cognitive psychology has sought to know how human organisms cognize the world around in terms of perception, thinking, learning, language use and postulate process, procedure and product of mental operations. It is "a branch of psychology which deals with the study of the nature and learning of systems of knowledge, particularly those processes involved in thought, perception, comprehension, memory and learning. In recent years cognitive psychology has been related to mentalistic approaches to linguistics, especially Chomsky's Transformational Generative Grammar, which links language structure to the nature of human cognitive processes" (*Cognitive Psychology* 1985, p. 44).

It has established a relationship between cognition and language. The explanation is like this: If cognitive is equal to human knowledge, it should be represented through modes of thinking—the major instrument of which is human language. Under different mental operations, thinking and saying in language use are correlative. For, subject to specific conditions made, human organism says thoughts and thinks to say.

It was postulated that the ability to express concepts into spoken or written words is correlative to 'configuration' (Koffka, 1952) or 'approximation' (Russell, 1961) of the "internal speech that is never uttered" into "the things said out loud" (*ibid.*, p. 191). This seems to be comparable with the 'transformational generative grammar' which Chomsky (1971) argued to be at the root of a speaker's competence to transform 'deep structure' into 'surface structure'

Attempts to express a concept, taken together, is "like a target: it may have a bull's eye, but the outlying parts of the target are still more or less within the meaning, in a gradually diminishing degrees as we travel further from the bull's eye. As language grows more precise, there is less and less of the target outside the bull's eye, and the bull's eye itself grows smaller and smaller; but the bull's eye never shrinks to a point, and there is always doubtful region, however small, surrounding" (Russell, 1962, p. 197-198). An inference from this suggests that a concept is never totally exhausted in expression. The other way round, linguistic expressions may be 'configuration' (Koffka 1952) of concepts; but these are no more than 'approximation' (Russell, 1961) better or worse—never the prototypes or exactness of concepts.

From the mid-twentieth century onwards the notion of concept began to be delineated with less verbiage and more business. To begin with, the given definition may be registered: "In philosophy the word 'concept' (of which 'conception' is an older equivalent) is very frequently employed; it is indeed so convenient as to be almost indispensable, though its use has sometimes been thought to raise difficulties ... Derivatively, to use, or to be able to use, the linguistic expressions in question would be said to be to apply, or to possess, those concepts" (*Concept and Conception* 1960, p. 193). Precisely, what the above implies is that something does not become a concept so long as it remains only an ideational experience and so long as it does not turn out to be an operative experience, i.e. so long as it is not expressed in any form of language, in coherent ideational structures and functional linguistic frames.

One of the basic assumptions of Piaget was that the functions of "perception and thinking represent two sharply differentiated processes which display structural similarities, but even more important differences" (Wohlwill 1968, p. 479). On this Piaget's postulate was that "the formation of concepts and the underlying systems of classification was due to something more fundamental than socio-linguistic communication, language being a necessary but not a sufficient condition for the formation of classes and the structure of relationship" (Lovell et al. 1968, p. 225).

Taba (1966) tried to analyse the process of thinking from the point of psychology and logic. She postulated that (a) 'thinking' could be taught, (b) thinking is the active or activated media to have the individual and data, gathered from extra-individual sources, to interact, (c) mastering certain skills of thinking lawfully follows mastering certain earlier skills of thinking, and (d) for teaching such skills "teaching strategies that observe these sequences" (Taba, p. 35) are required. Concept formation, interpretation of data and application of principles were identified by her as means for teaching inductive thinking.

Ausubel (1963) worked in applied educational psychology with a view to helping learners construe the optimum information from teacher-speak in respect

of verbal learning. He believed that in order to process new information the existing "cognitive structures" (p. 27) have to be organised and the organisation must be purposive, i.e. directed towards the achievements of well-defined goals. His principles may be compared with those of Tolman's (1948) on the view of cognitive mapping. "The stimuli which are allowed in are not connected by just one-to-one switches to the outgoing responses. Rather, the incoming impulses are usually worked over and elaborated in the central control room" (i.e. mind) "into a tentative cognitive map of the environment" (p. 192), and it is this map that determines responses owing to generalisation of 'class' and 'non-class' of environment-relative inputs.

Bruner et al. (1977) concluded that concepts are formed as a result of individual's categorising and labelling object-experiences or experience-objects in terms of 'class membership' of attributes. While categorising objects, events, aspects into classes, certain criteria or cues are used. Categorisation happens in case of both concept formation and concept attainment—two separate thinking processes. They further tried to prove that concept organisation may be taught through conscious categorisation, i.e. by making one know criteria for selecting particular attributes of a certain thing and ignoring others which are not intended.

Keeping the above in view, the stand of cognitive psychology in relation to concept formation and language use may be analysed through an analogy—between 'conception' and 'conscious language learning' and 'perception' and 'language acquisition'. Learning a second language is conscious and specific while acquiring native tongue is unconscious and spontaneous. Likewise, conception requires a subject to "think about his experience in words" (Vernon 1971, p. 36) consciously and be specific to try "a tentative ordering of a body of knowledge" (Bruner 1977, p. 60) already stored or presently stored along the contours of experience on the memory surface. On the other hand, perception is unconscious and spontaneous. It is under certain relatively specific cues and situations—acting as stimuli—that responses in terms of "certain artificial organizing patterns ... become established" (Bono 1981, p. 220) in the forms of concept. Therefore, concepts could be termed activated percepts.

Summarily, the cognitive approach towards the role of concept formation in language use deemed rather behavioural—never behaviouristic.

As time has aged, mechanical behaviourism has given in and psychological behaviourism has welcomed explanations of cognitivism,

Language is the major vehicle of concept-communication. First language use is a process of learning, second language of acquiring. In both the cases language is used to materialise concepts. Hence operations in language use—both learning and acquiring—are cognate with concept formation and concept attainment.

# CONCEPT STUDIES: CONTROVERSIES AND AGREEMENT WITHIN COGNITIVE PSYCHOLOGY

Like philosophical speculations, psychological studies over the nature of concept have also vouchsafed controversies. Bruner, Goodnow, Austin (1962) summarised the principal controversy in this way:

"There are those who urge that a concept, psychologically, is defined by the common elements shared by an array of objects and that arriving at a concept inductively is much like 'arriving at' a composite photograph by superimposing instances on a common photographic plate until all that is idiosyncratic is washed out and all that is common emerges. A second school of thought holds that a concept is not the common elements in an array, but rather is a relational thing, a relationship between constituent part processes" (p. 244).

According to them, the "working of a concept is the work of inferences that are or may be set into by an act of categorisation" (*ibid.*, p. 244). Having agreed upon the process of inferring class identity on the basis of 'critical attribute values'—a contemporary granted notion of concept formation—they reserved a note of dissent that by way of 'categorisation' inferences from 'class identity' on to other properties may not be necessarily connected in terms of common-elements-relationship. Concepts may be 'conjunctive', 'relational', or 'disjunctive' the certainty or probability of which would depend on "the attributes by which their fitness to a category is determined" (*ibid.*, p. 9).

In relation to 'critical attributes values' contributing to categorisation, the relationship between perception—visual, auditory, and speech—and conception also underwent exploration. The following quotes should report the resultant findings:

- (a) "The ideational field depends most intimately upon the sensory, and any means that enable us to become independent of immediate perception, are rooted in perception, and in truth, only lead us from one perception to another" (Koffka 1952, p. 49).
- (b) "Perception involves an act of categorisation ... the nature of inference from cue to identity in perception is in no sense different from other kinds of categorical inferences based on defining attributes ... there is no reason to assume that laws governing inferences ... are discontinuous as one moves from perceptual to more conceptual activities" (Bruner 1957, p. 123).

Another agreement could be noted with Wohlwill (1968). For him relationship between perception and conception was located in "three dimensions ... (1) Redundancy: As one proceeds from perception to conception, the amount of redundant information required decreases. (2) Selectivity: As one proceeds from perception, the amount of irrelevant information that can be tolerated without affecting the response increases. (3) Contiguity: As one proceeds from perception to conception, the spatial and temporal separation over which the total information contained in the stimulus field can be integrated increases" (p. 484). Having acted on these dimensions, the responses relatively approximate-specificity through the process of error reduction.

The generalisation that followed was that concepts were encoding of percepts that are stored in human experience. Therefore experience-storage should be the source for encoding and encoding should be generated through memory retrieval.

Modern psychology has recognized the relationship between memory—short term or long term—and concepts. It holds that memory and concepts are inter-dependent. It asserts that the mess of memory is unlocked with the 'cues' that are variably fit to retrieve percepts from memory. Tulving and Thompson (1973) take an effect-to-cause look at this: "Specific encoding operations performed or what is perceived determine what is stored, and what is stored determine what retrieval 'cues' are effective in providing access to what is stored" (p. 269).

At this point it appears sound to have a reference to contemporary memory-research. Tulving (1972) identified a distinction between 'episodic' memory and 'semantic' memory. According to him, "Semantic memory is the memory necessary for the use of language. It is a mental thesaurus, organised knowledge a person possesses about words and other verbal symbols, their meaning and referents, about relations among them ... Semantic memory does not register perceptible properties of inputs, but rather cognitive referents of input signals ... The semantic system is probably much less susceptible to involuntary transformation and loss of information than the episodic system" (p. 386).

The notion of 'semantic memory' seems quite relevant as regards learning language. One of the major bases of language use is exploitation of experiences that are to be retrieved from various memory surfaces. Most of our passive concepts lie there. In order to put them or bring them into communication frames these are to be activated.

#### DIVERGENCE — BEHAVIOURISM VS COGNITIVISM

Notwithstanding the fascinating propositions and propagations of emerging Gestaltists and consolidating cognitivists, theories and practices of Behaviourism have thrived. Truly speaking, the Gestalt and cognitive views have been no little exasperating for the behaviourists who were more interested in, and bent upon, finding out physiological explanation of organism's behaviour. Below are given two quotes to register the extreme reactions of the behaviouristic school against the cognitive school.

1. "We must not mix up physiological and physical terms and conceptions, as is so often done by popular writers. Such a phrase ... as 'a thought flashed through my brain' is quite illegitimate. Thoughts belong to the mind, not to the brain ... Scientific writers often fall into the same mistake ... In order to gain a clearer insight into the actual contents of the mind we must conceive of it as a network of mental network ... the well-known fact of association between mental elements, a fundamental condition of all physical processes ... The network of associated mental elements is to a large extent organized into systems to which the name 'complexes' has been given" (Tansley 1929, p. 27, 57-59).
2. "The use of the term 'concept' is particularly misleading in linguistic analysis ... Processes of perceiving caused in an interpreter by the action on him of external objects have been commonly called 'perceptions' ... Other processes, more abstract or less obviously caused references have similarly been called 'conceptions'. But whereas the double sense of the term 'perception' involves merely a confusion between two possible referents or sets of referents, the one inside

the head and the other outside, the term 'concept' when thus duplicated has been a special inducement to the creation of bogus entities" (Ogden and Richards 1966, pp. 99-100).

As such the behaviourist's attempt to scan the mechanism of the mind of the mind-mechanism has often been not only unequivocal but also confusing. Attempts were made to set the confusion right, on behalf of the other school. The following excerpt is an example of this.

"Sense is that which gives us data of experience, thought or reason on the other hand is a faculty of comparing and manipulating such data, in the light of principles that it derives mysteriously from its own being or nature. In the theory of knowledge this leads to insuperable difficulties, and in the end to a profound scepticism of the value of thought or reason as an instrument from arriving at the true nature of reality ... Relatively, we speak of data and the principles that explain them; but the data are not merely given, they already contain elements of thought and reason ... Sense without thought is blind, and thought without sense is empty" (Ginsberg 1964, pp. 30-31).

The principles and theories of behaviourism went too strong, even past the fifties, to be evanescent. Nor have these been ever extirpated by the compelling wind of cognitive approaches after that. These are still there till date—of course, shorn off their weaknesses. Yet one cannot help wondering at the rigidity with which behaviourism once abhorred the mentalistic approach to cognition. One instance would suffice:

*Psychology of Adolescence* (Cole 1964), a book originally published in 1936, would have no delineation of development of concept and write "Reasoning, Thinking, Judging, Obtaining insights ... all refer to the same kind of ability to deal constructively with facts, to rearrange them, to draw conclusions, or to 'see through' them" (p. 160)

However, the cognitive school gradually grew too strong not to be stronger critique of the behaviouristic school. Bandura's (1971) comment may be considered in this regard:

"A valid criticism of the extreme behaviouristic position is that, in vigorous effort to eschew spurious inner causes, it neglected determinants of man's behaviour arising from his cognitive functioning. Man is a thinking organism possessing capabilities that provides him with some powers of self-direction. To the extent that traditional behavioural theories could be faulted, it was for providing an incomplete rather than an inaccurate account of human behaviour" (p. 2).

## CONVERGENCE — BEHAVIOURISM VS COGNITIVISM

It would be perhaps wrong to say behaviourism and cognitivism ever converged or coagulated. As a matter of fact it was rather a process of dissolution—especially on the issue of concept studies. As the field of psychology underwent evolution, the behaviouristic school gradually accepted cognitive approaches towards concept studies.

Initially the behaviourists tried to operationalize knowledge objectively and do away with mentalistic 'ideas' from the theories of psychology. Opposed to this, the Gestalt school achieved the greatest success in the field of 'perception' which was the starting point of cognitive psychology too. Of late the behaviourists seemed to have accepted the role of 'Gestalt' in such areas where mentalistic operations in terms of perception and conception take place.

Tolman's (1932) purposive behaviourism, which was later termed 'sign Gestalt theory' or 'expectancy theory', paved the way for further acceptance.

Gradually, the strong currents of behaviourism had to face yet stronger critiques from the cognitive school that started developing fast after the fifties. Naturally the stronger currents got absorbed—losing their perspicuous authorities—and flew passive within the general trends of the ensuing years.

Later on the rigid physiological bias of the behaviourists softened and dissolved, and behaviourism inclined towards cognitivism. Nevertheless, behaviouristic adherence was not lost altogether. This could be presumed from Bernard's observation: "Thinking involves dealing with abstractions, the not yet tangible and these abstractions are manipulated by means of symbols" (1965, p. 74). He understood that "concepts are general or abstract mental representation of situations or conditions. While simple associations are a one-to-one affair, concepts involve many interrelationships and conditions. Several percepts are combined in terms of some cogent relationship or common theme to form a concept" (*ibid.*, p. 25), and generalised that "learning is characterised by changed perception, improved reactions, differentiation of stimuli and responses, integration of stimuli and responses, and achievement of understanding or insight" (*ibid.*, p. 48). Thus concept formation was classified under a higher order cognitive ability bearing a justification of 'field theory', that was a contribution to personality-psychology by Lewin (1890-1947), a noteworthy cognitivists. Lewin theorised "that behaviour is determined by psychological field consisting of an organised system of stresses or strains (forces) analogous to a gravitational or an electromagnetic field" (Hall and Lindzey 1985, p. 383) wherein 'perception' takes place with reference to the context of total field. Lewin (1951) defined 'field' as "the totality of coexisting facts which are conceived of as mutually interdependent" (p. 240).

However, thinking was labelled as a symbolic activity of the mind too: "Although ... man's overt behaviour is a minimum, he is intensely active. He is implicitly engaged in the manipulation of symbols which stand for objects or events that are not necessarily present. Behaviour of this kind is implicit symbolic activity" (Karn and Weitz 1960, p. 105). Concept formation was recognized as an internal mental behaviour wherein learning is due to 'transfer' that results from associative 'chaining' of symbols: "The real significance of symbols in achieving rapid and effective adjustments is perhaps best appreciated if you realize that symbols provide a means whereby we can disregard certain aspects of a concrete object and concentrate upon others. The symbolic process that represents the similarities in otherwise diverse objects or events is called a concept" (Karn and Weitz 1960, pp. 105-6).

The forgone citations prove that in the field of concept-studies adherence to behaviourism occasionally pulled back psychology; but the greater swing always



grew in favour of cognitivism. And finally this school marked concept-psychology for its own. Later, the behaviourists' acceptance and cognition of 'cognitive psychology' could be seen in Gagne's view: "Learning a concept means learning to respond to stimuli in terms of abstracted properties ... as opposed to concrete physical properties" (1965, p. 47) on account of "a number of multiple discriminations" (*ibid.*, p. 132), and "the generalising capability provided by concept learning goes far beyond the stimulus generalisation that is a fundamental property of S-S-R learning" (*ibid.*, p. 136).

Coming to date, "cognitive psychologists try to understand the 'mind' and its abilities or achievements in perception, learning, thinking, and language use ... and view the human brain as a kind of computer; like a computer, the mind has many distinct levels of organisation" (Bower and Hilgard 1986, p. 421).

#### ROUND-UP

The comparatives having been screened, the implications of concepts studies are now to be screwed down.

First of all, the views of various schools are to be summarised. Next comes the task of generalising relevant implications. Finally the utility and scope of the readings, in the applied field, is to be stated.

#### *Panel Report of the Debate*

Although progressive psychology was empirical in nature, it was first to define concepts in comparatively discrete way: Sense data or human experience is chaotic and unorderedly. Human mind has its own mechanism to interpret sense-experience. As a result, concepts are formed and become meaning.

The School of Associationism, on its turn, went to assert that ideas, received by human mind, cohere through the process of association.

The School of Behaviourism never accepted the notions of 'consciousness'. It ventured to explain human behaviour in terms of cause-effect physical principles. Since language use is elementally a human behaviour, it argued, language learning was also a behaviouristic phenomenon. Language is learnt through the process of bond-establishment between stimulus and response—conditioned or operant.

The Gestalt school was concerned most with 'perception'—how external environment was cognized by human organism. It claimed that the amount of cognition was correlative to the amount of expression. Therefore, subject to specific coordination, percepts would be organised into concepts. And language mechanism was the major instrument for realising these concepts.

The Cognitive School established relationship between cognition and language use. It not only probed how the world around us was cognized but also explored how cognizance was interpreted with the help of language.

It might look improper to compare and contrast the behaviourist school and the cognitive school on the point of their contribution towards concept studies—especially where the issue is relationship between concept and language use. Any comparative reading would be rather uneven—for the simple reason that the former has paid little concern to the relationship in question while the latter has heeded the most about it. Notwithstanding this fact, one could infer from their studies two major generalisations:

1. For Behaviourists: Human being is conditioned to use language for interpreting the world around and experience therein.
2. For Cognitivists: Human cognition is structured and organised for him to interpret the world around and experience therein with the help of language.

#### *Implications—Purposive Structuring of Cognition and Human Expression*

The significance of cognitive psychology, as regards concept studies, lies in the fact that it has been trying to define and deplore the role of cognition in learning how to use language—the most effective tool for overt human behaviour. Owing to generalisation (2) in 7.1., it can be assumed that structured or organised cognition is the root of human language, i.e. human expression. Now language learning for educating beings is purposive. Therefore it follows that purposive structuring or organising of cognition would lead to better language learning.

Keeping the above in view, the implications of concept studies may be summarised:

1. Experience storage depends on the faculty of reading 'patterns' in the physical and social environment. Language is the vehicle of human mind to make ideational constructs articulate in speech and writing. Concepts are formed consciously or unconsciously in a kind of inner speech. External speech configures or approximates inner speech.
2. Sense provides data of experience. Thought manipulates and compares data. Given a particular stimulus, e.g. asked to say something on something, faculty of the mind—reasoning, judgement, etc.—reconstructs concepts following intended goals. By way of organising concepts an individual should be able to express in a better way.
3. Objects, states, dispositions, happenings are perceived in a total field where 'field' means perspective, dimension, or setting. A concept is born in a field. When it is recalled and reconstructed, it becomes a notion in a particular setting. Language does the communicative function for expressing that notion in that setting.

4. Concept organisation sets human organism in a conscious process where it is made to think or to be creative in a desired manner. If purposive effort to articulate experience is the cause, organisation of concepts may be considered the effect. Thinking and retrieval of experience are the main intervening variables—apart from individual ability, interest, motivation, etc.—that shapes cognition into language. Hence concept organisation calls for purposive structuring of cognition.

#### RELEVANCE OF CONCEPT STUDIES IN MODERN LANGUAGE EDUCATION

Modern education pays a great deal of attention to language education—language learning and teaching at various stages and levels. Studies of cognitive psychology relating to concept organisation and language learning, find relevance in the area of language education. Researchers and practitioners are helped to draw assumptions and postulates that provide foundations for innovating new strategies in the teaching and learning of languages. These are put below in a compression:

First, individual-environment interaction is the root of cognition.

Second, active arousal of cognition is required for structuring experience.

Third, thinking could be taught—various strategies are to be employed.

Fourth, a strategy evokes purposive organisation of cognitive structures.

Fifth, it seems probable that given specific cues, human organism can organize and reconstruct experiences accordingly.

#### TENTATIVE STRATEGY FOR LANGUAGE TEACHING AND LEARNING

Concept organisation strategy requires an atmosphere where optimum social interaction is available. Every learner must be a member of a simulated social group. This would enrich one's experience and bridge up the experience gap. Participation in the same social-class-membership would bring the group of learners to a level of homogeneity of concepts—what notions are to be communicated, what setting these notions locate as universe of discourse, and what functions represent them in communication.

It is a strategy of teaching language which sets out with making the learners react in such a way that one's 'complex' feels total involvement. Complex of every individual is to act in a social field that frequently alludes to past, present, and future experiences. A field refers to a 'setting'. When the field is identified, it becomes easy to configure particular 'Notions' in that setting, and easier to realize the notions in 'Communicative Functions'.

## CONCLUSION

Concept organisation evolves a logical computation of cognized experience data. It suggests a strategy which is inclusive of operations like collecting experience data, charting them, sorting them, editing them, drafting them, and so on. These operations steep communication-contents—that are basically psychological constructs—in logicity and relevance; and vouchsafe cohesion and coherence for communicative functions.

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# **A Path-analysis Model of Mathematics Problem-solving for Secondary School Students**

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**M**UCH of the recent research in mathematics problem-solving has been exploratory, mainly accumulating information about students' problem-solving abilities. This has been productive and helpful in understanding and developing theories of problem-solving that have relevance to students' school mathematics learning. However, many of the models applied to mathematics problem-solving have been adapted from models proposed by psychologists for general problem-solving (Newell and Simon, 1972). Other models have derived from suggestions on problem-solving (Polya, 1957) or from information-processing concepts (Wickelgren, 1974). Of these models, clear theoretical models have not been formulated.

(Kulm and Bussmann, 1980). This suggests the need for developing a multivariate model as means for better understanding of mathematics problem-solving among secondary school students. The model could help to suggest steps that could be taken to increase better performance in mathematics, and also serve as a focal point for further research in mathematics education.

The central purpose of the study is to develop a valid path-analysis model of problem-solving in mathematics and to determine the hierarchy of the total effects of the factors on mathematics problem-solving.

## DESIGN

The design adopted for the investigation was the exploratory method using four separate questionnaires and eight mathematical achievement tests. This design was non-experimental since the variables were not under the control of the investigator.

## SAMPLE

The subjects of the study were 820 junior secondary students made up of 512 male and 308 female randomly selected from 20 schools in the Cross River State of Nigeria in the 1985-86 academic year. The age-range was from 12 to 20 years with an average of 14.3 years and standard deviation of 1.1.

## INSTRUMENTS

The instruments used for the study were grouped as follows:

### *A. Home Background Factors*

The instrument used for gathering data on home background factors was a Home Background Questionnaire (HBQ) adapted from various such instruments prepared by experts in the Department of Teacher Education and Institute of Education, University of Ibadan.

The instrument measured two variables, namely parents' socio-economic status (acquisition of wealth and occupational status) and parents' level of education as determined by the highest qualifications of parents and the amount of English spoken at home. These two variables constituted Home Background Factors of Students.

### *B. Cognitive Abilities*

Three separate mathematical achievement tests were used to assess students' cognitive abilities. The tests are described below:

- (i) *Test of Comprehension and Application in Mathematics (TCAM)*: This was a parallel test used by Meyer (1978) in assessing comprehension of a problem situation and application of pre-requisite skills in solving problems in mathematics. Each test item was made of an ITEM STEM, each of which contained two questions related to the stem; a comprehension question and an application question. Each comprehension question assessed understanding of the information contained either implicitly or explicitly in the stem. The application questions assessed mastery of pre-requisite concept or skill for solving the problem. Each comprehension question required the respondent to circle TRUE or FALSE while each application question required the respondent to work out the problem elsewhere and write only the answer in the space provided. The test consisted of 15 items and was designed to yield two scores: a comprehension score and an application score. After trial out, the reliability of the test was found to be .85.
- (ii) *Test of Computation in Mathematics (TCM)*: This was a forty-item multiple choice objective test. It was designed to assess students' competence on such computational activities like addition, subtraction, multiplication, division, performing any two or more operations and carrying out an algorithm which they had gained at the end of the junior secondary school. The reliability of this instrument was found to be .83 after the pilot work.
- (iii) *Test of Reasoning Ability in Mathematics (TRAM)*: This was a parallel test used by Ginther (1978) in determining predictors of mathematics achievement for Chicano junior high school students. In this test, the respondents were required to determine which operation would be most appropriate for solving the problem without actually carrying out the computation. It was fifteen-item objective test. The reliability was found to be .85.

The variables comprehension, application, computation and reasoning constituted students' cognitive abilities. The cognitive ability score for each student was the sum of all the scores on these four variables.

### *C. Affective Factors*

Three instruments, namely Attitudinal Measurement Scale (AMS), Motivational Intensity Measurement Scale (MIMS) and Creativity Assessment Scale (CAS) were used to measure affective factors.

The attitudinal scale was a modified version of the attitude scale used for the second mathematics survey of the International Association for the Evaluation of



Educational Achievement (IEA) adapted from Chacko (1981) and Osafehinti (1984). This instrument had thirty-one items, with four options ranging from "Strongly Agree" (SA) to "Strongly Disagree" (SD). Some items indicated positive while others indicated negative attitude. The reliability was determined to be .89.

Motivational Intensity Measurement Scale (MIMS) was a modified version of Gardner and Lambart (1959). It was designed to measure the degree with which subjects apply themselves to the learning of mathematics. The scale was made of ten items and each had three points of intensity. The reliability was found to be .84.

The Creativity Assessment Scale (CAS) was an adaptation of the Ibadan Creativity Assessment Scale (ICAS) developed by Akinboye (1977). The ICAS is a battery of four behavioural scales consisting of Ideative Flexibility, Ideative Fluency, Ideative Originality and Creativity Motivation. A composite of the items selected from the four sections formed the Creativity Assessment Scale for the present study. It consisted of 29 items and required subjects to rate themselves on a five-point scale in the increasing order of magnitude of what was most descriptive of them. The reliability of this instrument was determined to be .90.

The variables attitude, motivation and creativity constituted students' affective factors. The affective factor score for each subject was the total of all the scores on these three variables.

#### *D. Mathematical Language Factors*

Two separate instruments were used to measure mathematical language factors.

(i) *Test of Mathematical Terminology and Symbolism (TMTS)*: This test is a modified version of Otterburn and Nicholson (1976). It was drawn up first by listing words in mathematics texts and the junior secondary school syllabus that are commonly used in the mathematics classes. The test was a composite of three variables, namely:

- (a) ability to understand mathematical terms;
- (b) ability to express mathematical terms symbolically;
- (c) ability to represent mathematical terms diagrammatically or numerically.

The final form of the test consisted of 50 words. In the first column, the respondents were required to put "Yes" if they understood what the word meant, "No" if not. In the second column, they were required to write the symbols for the words if it had one (not all the words had symbols). In the third column, they were required to draw a diagram or use words to show what the word meant.

The reliability indices for the different variables in the test were column I, .83; column II, .79 and column III, .78.

(ii) *Test of Mathematical Reading Ability (TMRA)*: This test was developed using Earle's model given by Bell (1978). According to Bell, Earle's classroom model of assessing mathematical reading contains four levels, namely:

- (a) perceiving symbols;
- (b) attaching literal meaning to symbols;
- (c) analysing relationships among symbols;
- (d) solving mathematics exercises stated as word problems.

The reading test was, therefore, designed to measure the above abilities of Earle's Model. The final form of the test consisted of 25 items and had reliability index of .72.

The above measured variables in the two tests constituted mathematical language factors. The total score on all the four variables determined mathematical language factor of each student.

#### *E. Mathematical Problem Characteristics Factors*

Two separate mathematical achievement tests, namely Test of Understanding of Mathematical Problem Structure (TUMPS) and Test of Understanding Mathematical Problem Content (TUMPC) were developed to measure problem characteristics.

Days et al. (1979) examples of simple and complex problem structures assisted the investigator in developing the Test of Mathematical Problem Structure. Clarkson's (1975) examples of problem content guided the investigator in developing the Test of Mathematical Problem Content.

On the basis of a pilot work, 15 objective items were selected from each test of problem structure and problem content. Their reliability indices were .81 and .70, respectively.

The variables Problem Structure and Problem Content constituted mathematical problem characteristics factors. The total score on these two tests determined the problem characteristics factor of each student.

#### *F. Mathematical Problem-solving Ability*

Mathematical problem-solving means the ability to use acquired knowledge to find solutions to mathematics problems. It also involves the ability to select data from verbal context, selection of an appropriate operation, and performance of computation in order to find solution to a mathematics problem. It has two aspects:

- (a) the process or set of behaviours or activities that direct the search for solution; and
- (b) the product or the actual solution (Kantowski, 1977)

## A PATH-ANALYSIS MODEL OF MATHEMATICS PROBLEM-SOLVING

Problem-solving ability or problem-solving performance refers to students' cognitive achievement as measured by the Test of Mathematical Problem Solving Ability (TMPSA).

Four problems were developed using Dahmus' (1970) model. The test reflected the four major divisions of the Junior Secondary School syllabus, namely Arithmetic, Algebra, Geometry and Measurement, and Statistics. Each problem was followed by a set of activities that determined the mathematical processes required to solve the problem completely in order to get the product.

### ADMINISTRATION OF INSTRUMENTS

The administration of the instruments was carried out in the last term of the 1985-86 session in the then Cross River State of Nigeria. The pilot work had already been done in three schools in Ibadan in the month of February 1986.

Since the schools were many and spread over the entire states, the mathematics teachers in the target class assisted the investigator in the administration of the instruments. They were instructed to administer each instrument each day starting with the Home Background Questionnaire. The Measuring Scales were administered before the achievement tests. All the instruments were administered during official school hours. The investigator visited the participating schools to ensure that the teachers carried out the instructions for the administration of the instruments.

Before developing the path analysis model, a conceptual model was thought of. Figure 1 shows the diagrammatic representation of the conceptual model for the study.

In the model, the antecedent variables, namely home background factors and students' characteristics (both cognitive abilities and affective factors) are on the extreme left. The transaction variables, namely mathematical language and problem characteristics occupy the middle portion of the model. The final stage in the model contains only the criterion variable—problem-solving ability.

In the model, students' characteristics are considered dependent on home background factors. Mathematical language factors and problem characteristics are considered dependent on students' characteristics and home background factors. Students' problem-solving ability is dependent directly on the antecedent variables and via mathematical language and problem characteristics. Problem-solving ability also depends directly on the interactive variables.

### PATH ANALYSIS

Path analysis is a method of using, displaying and interpreting results gained from standard regression procedures. These procedures are used in the framework

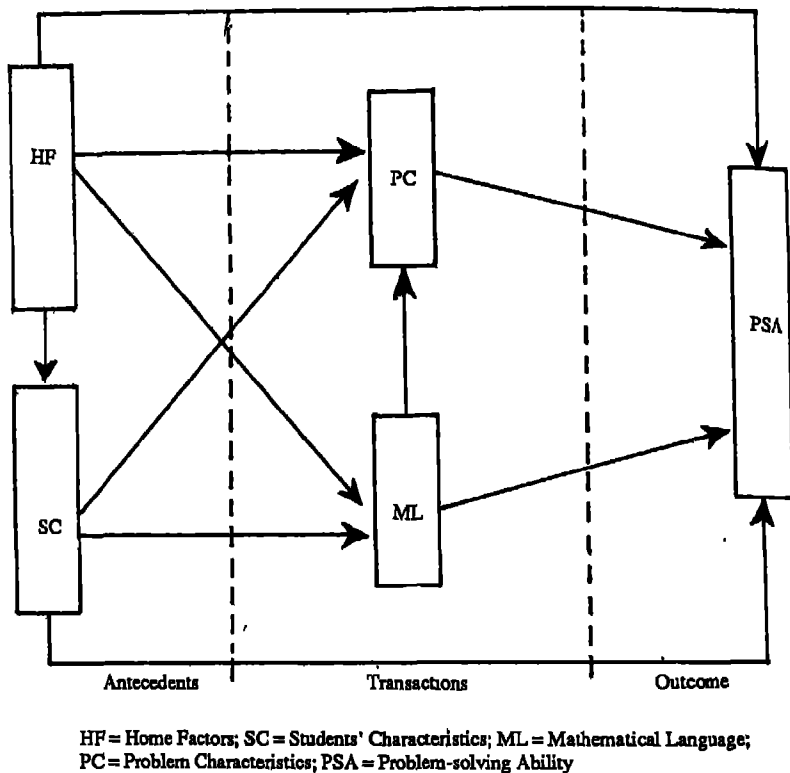
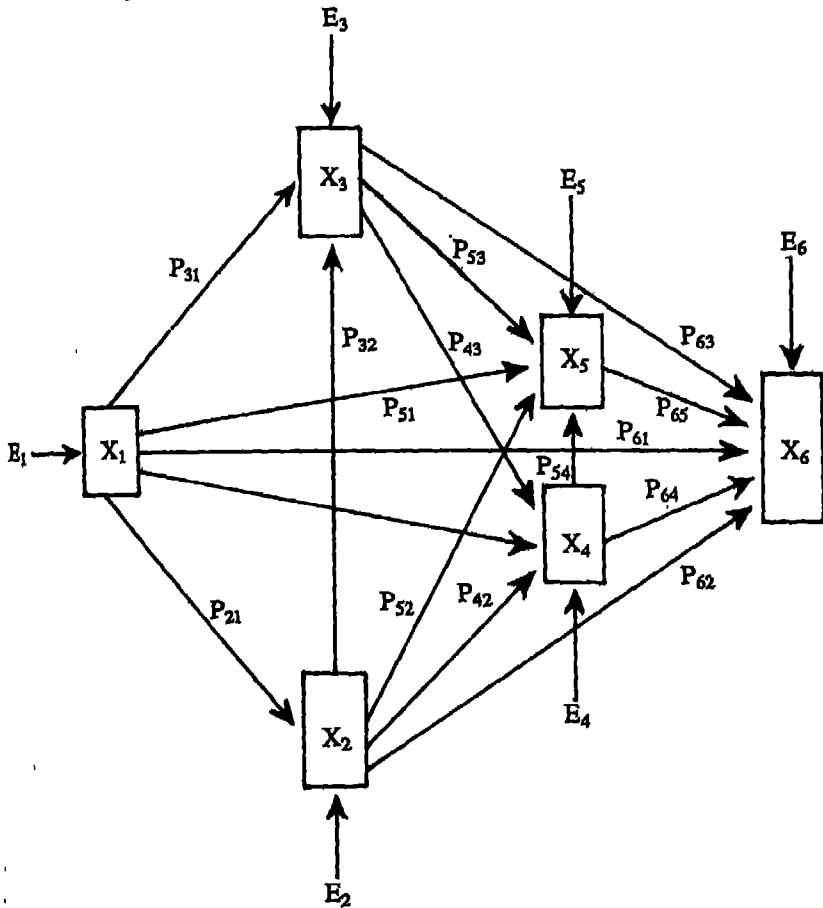


FIG. 1. Conceptual Model

of a graphical model formulated by the researcher on the basis of knowledge and theoretical considerations to achieve a representation of a set of interrelated variables. The final result is a causal model showing the directions and magnitudes of interrelationships among a set of causally-related variables. This technique has been found useful for understanding causal relationships developed from survey data in situations where controlled experiments were impossible or impracticable (Bryant and Dorman, 1977). The method affords the decomposition of correlations among variables, thereby enhancing the interpretation of relations as well as the pattern of the effects of one variable on another (Wolfe, 1980).

In order to develop the path diagram, path analysis, which is suitable for investigating causal relationships, was deemed the most appropriate statistics to establish intercausal connections among the set of variables. This was done based on the hypothesized path analysis model given in Figure 2.



$X_1$  = Home Factors;  $X_2$  = Affective Factors;  $X_3$  = Cognitive Factors;  $X_4$  = Mathematical Language Factors;  $X_5$  = Problem Characteristics Factors;  $X_6$  = Problem Solving Ability

FIG. 2. Conceptual Path Model for Problem-solving Ability

A path diagram or path model is a device for displaying graphically the pattern of causal relations among a set of variables. For example, Figure 2 depicts a path diagram consisting of six variables. In the figure, the straight arrows represent the investigator's hypotheses of non-zero causal effects. The arrow-heads point towards the influenced variables. For example, the arrows from  $X_4$  to  $X_6$  represent

the verbal statement, "lack of mathematical language acquisition is the cause of students' failure in their ability to solve problems in mathematics". Thus  $X_4$  is assumed to be the cause of  $X_6$  while  $X_6$  is called the effect. Similarly  $X_1$  is said to be the cause of  $X_2, X_3, X_4, X_5$  and  $X_6$  directly while  $X_2, X_3, X_4, X_5$  and  $X_6$  are the effects of  $X_1$ . The model was developed on the basis of the relationships obtained in Figure 1 (Akpan, 1987).

The structural equations for Figure 2 are:

$$X_1 = E_1$$

$$X_2 = P_{21}X_1 + E_2$$

$$X_3 = P_{31}X_1 + P_{32}X_2 + E_3$$

$$X_4 = P_{41}X_1 + P_{42}X_2 + P_{43}X_3 + E_4$$

$$X_5 = P_{51}X_1 + P_{52}X_2 + P_{53}X_3 + P_{54}X_4 + E_5$$

$$X_6 = P_{61}X_1 + P_{62}X_2 + P_{63}X_3 + P_{64}X_4 + P_{65}X_5$$

where  $P_{ij}$  = path coefficients,  $i = 1, 2, \dots, 6$ ,  $j = 1, 2, \dots, 6$  and  $E_i$  = a residual variable associated with each variable to account for outside influence ( $i = 1, 2, \dots, 6$ ).

On the basis of the above six structural equations, 15 'normal' equations were derived.

In the model, variable  $X_1$  (home factors) was treated as an exogenous variable, that is, it was not influenced by other variables in the diagram; for example, variables  $X_2$  (students' affective factors) and  $X_3$  (students' cognitive factors) cannot in any way influence their home background factors. Accordingly, any variability in them would be attributed to the influences outside the path diagram. Variables  $X_2, X_3, X_4, X_5$  and  $X_6$  were treated as endogenous variables, that is, their variability could be explained by the influence of both exogenous and endogenous variables. Variable  $X_6$  (problem-solving ability) taken as an endogenous variable was influenced directly and indirectly by all the variables that preceded it in the diagram. The  $E_i$ ,  $i = 1, 2, \dots, 6$ , which represented the unmeasured variables that impinged upon the endogenous variables were also included in the path diagram. The path coefficients  $P_{ij}$ ,  $i = 1, 2, \dots, 6$  and  $j = 1, 2, \dots, 6$  represented the impact of one variable on the other. In other words, a path coefficient indicates the direct effect of a variable hypothesized as a cause of a variable taken as effect. For example,  $P_{42}$  in the figure indicates the direct effect of variable 2 on variable 4.

The single arrow-head shows the direction of the effect. This unidirectional representation of the arrow-heads from exogenous to endogenous variables demonstrates that the path diagram is a recursive model which is specified by a set of standardized structural equations.

In the recursive model, all variables are ordered causally with respect to one another. A recursive model like this one permits the researcher to obtain estimates

of the extent to which intervening variables account for relationships among pre-determined and subsequent variables. These may be interpreted as direct causal effects. In addition, the researcher may obtain estimates of the extent to which antecedent variables account for relationships between variables. These may be interpreted as spurious effects.

The path analysis statistics (a series of multiple regression analyses) was then computed to throw some light on the tenability of the conceptual path model for students' problem-solving ability. In this statistical technique, the investigator assumed that:

- (i) the relations among the variables in the path diagrams were linear, additive and causal, consequently excluding curvilinear, multiplicative or interaction relations;
- (ii) residuals were not correlated with variables preceding them in the path diagram nor were they correlated among themselves;
- (iii) there is a one-way causal flow in the system, that is, reciprocal causation between variables was ruled out (Kerlinger and Pedhazur, 1973, p. 583).

## RESULTS

In order to establish relationships among variables in the path model, an intercorrelation matrix of six variables ( $X_1$  to  $X_6$ ) was obtained in the first instance. Thereafter, a series of regression analysis were carried out, based on Figure 2, to identify paths that were not significant. Table 1 gives the results of this analysis.

TABLE 1 Estimated Path Coefficients for the Path Model		
Path	Standardized Path Coefficients	P-Level
$P_{21}$	.370	.01
$P_{31}$	.281	.01
$P_{32}$	.033	NS
$P_{41}$	.327	.01
$P_{42}$	.200	.01
$P_{43}$	.492	.01
$P_{51}$	-.016	NS
$P_{52}$	.004	NS
$P_{53}$	.298	.01
$P_{54}$	.007	NS
$P_{61}$	.126	.01
$P_{62}$	-.011	NS
$P_{63}$	.472	.01
$P_{64}$	.188	.01
$P_{65}$	.016	.01
NS = Not Significant		

Table 1 reveals that five paths, namely  $P_{32}$  (affective factors and cognitive abilities),  $P_{51}$  (home factors and problem characteristics),  $P_{52}$  (affective factors and problem characteristics),  $P_{54}$  (mathematical language factors and problem characteristics), and  $P_{62}$  (affective factors and problem-solving ability) are not significant at .01 level of alpha. These insignificant paths were deleted from the original hypothesized path model.

Figure 3 gives the resulting path analysis model after trimming.

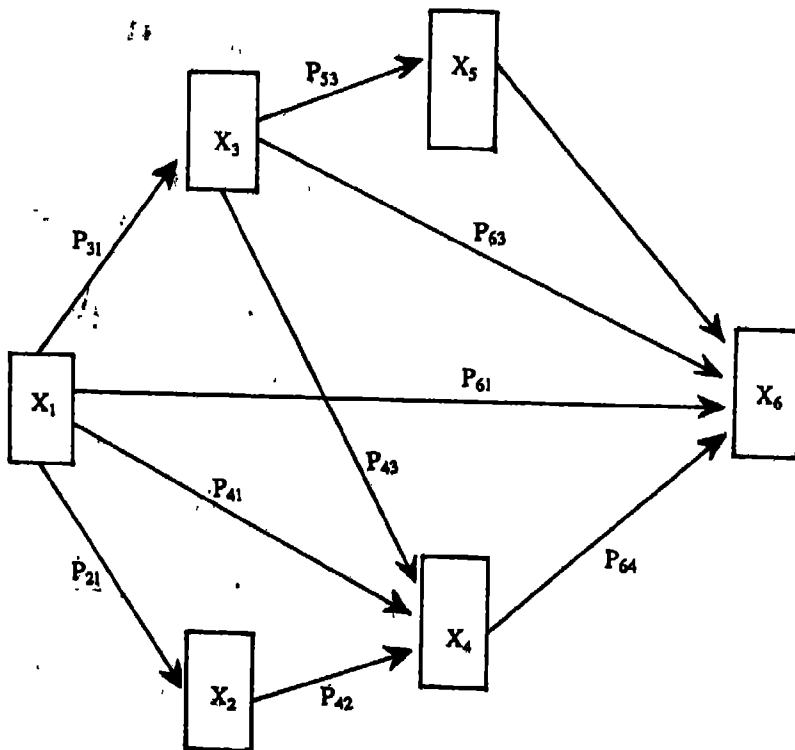


FIG. 3. Trimmed Path Model

An interesting observation from the trimmed path model is that students' attributional factors (motivation, creativity and attitude toward mathematics) have no direct effect on their ability to solve problems in mathematics while other variables have direct effect on the criterion variable. The effect of affective factors



on problem-solving ability is via mathematical language factors. Additionally, students' affective factors have no direct causal influence on their cognitive abilities and acquisition of problem characteristics variables. However, affective factors have direct effect on students' acquisition of mathematical language factors (terms, symbols, diagrammatic representation, and readability).

#### *Verifying the Efficacy of the Trimmed Path Model*

This was a recalculation of the correlation coefficient that were obtained by intercorrelating the six variables in the model using the normal equations and the derived path coefficients. Table 2 shows the original and reproduced correlations of the new path diagram.

TABLE 2 Original and Reproduced Path Coefficients		
Path	Coefficients	
	Original	Reproduced
$r_{12}$	.368	.370
$r_{13}$	.281	.281
$r_{14}$	.540	.540
$r_{24}$	.461	.459
$r_{34}$	.576	.584
$r_{35}$	.298	.298
$r_{16}$	.357	.361
$r_{36}$	.624	.616
$r_{46}$	.530	.530
$r_{56}$	.247	.247

Table 2 shows that the discrepancies between the original and reproduced correlations are very negligible. This points to the fact that the patterns of correlations in the data are consistent with the trimmed path model. Therefore, the new path analysis model is tenable in explaining causal relations among the variables in the model.

#### *Decomposition of Total Effect into Direct and Total Indirect Effects*

Table 3 shows the total effect of each influencing variable on a dependent variable and the decomposition of the total effect into direct and indirect effects attributed to other variables.

TABLE 3  
Total, Direct and Indirect Effects of Variables in the Path Model

Dependent Variable	Influencing Variable	Total Effect	Direct Effect	Total Indirect Effect
$X_2$	$X_1$	.370	.370	.000
$X_3$	$X_1$	.281	.281	.000
$X_4$	$X_1$	.540	.327	.213
	$X_2$	.459	.200	.259
	$X_3$	.584	.492	.092
$X_5$	$X_3$	.298	.298	.000
$X_6$	$X_1$	.361	.126	.235
	$X_3$	.616	.472	.144
	$X_4$	.530	.188	.342

Table 3 provides evidence to draw the following conclusions:

1. Cognitive abilities exert the strongest and most significant total effect on students' problem-solving ability.
2. Mathematical language, home background and problem characteristics variables in descending order of magnitude exert significant total effect on the criterion variable.
3. Cognitive abilities are most effective in enhancing students' understanding of the language of mathematics.
4. Home background factors exert positive and significant direct effects on both students' mental abilities and affective behaviours.
5. Students' affective behaviours have direct effect on their ability to understand mathematical language.
6. Students' affective behaviours have no direct causal impact on their ability to solve problems in mathematics.

## DISCUSSION

A major goal of the study was to develop a path analysis model of mathematics problem-solving ability among secondary school students. The emphasis in path analysis in developing a model using exploratory or confirmatory methods. In this study, the exploratory method was used. In the exploratory approach, model redesign includes successive fittings to the data until a satisfactory model is achieved. However, in confirmatory research, a model must be designed without using the data to confirm steps in the development, although some reference to the data may be needed for the selection and construction of some variables.

The model developed in this study shows that students' cognitive abilities (comprehension of a problem situation, application of prerequisite skills, computation and determination of most appropriate operations) are the most important variables required in solving problems in mathematics. The direct effect is much stronger than the total indirect effect. Cognitive abilities also exert positive and significant influence on students' efforts to understand both mathematical language and problem characteristics factors. The direct effect of cognitive abilities on mathematical language is much stronger than the total indirect effect. There is no indirect effect of mental abilities on problem characteristics. These suggest that students' mental abilities are very effective in enhancing their ability to understand both mathematical language and problem characteristics factors.

Home environmental factors exert positive and significant effect on students' acquisition of mathematical language variables. The direct and indirect effects are .327 and .213, respectively. The indirect effects are via students' affective behaviours and mental abilities. This finding provides evidence that parents' occupation, academic qualifications and the amount of English spoken at home have significant causal influence on students' acquisition of mathematical language. The total value of the indirect effect of home factors on mathematical language indicates that the indirect path of influence in a causal sequence is almost as important as the direct path. Home factors also have direct and significant effect on both students' affective and cognitive behaviours. These findings support the popular view that students obtain many of their attitudes and values from their parents.

In addition to home factors, students' affective behaviours are also relevant in their ability to acquire mathematical language variables. The total effect of affective factors on mathematical language is .459 while the direct and total indirect effects are .200 and .259, respectively. The indirect effect in this case is greater than the direct effect. This shows that the effect of affective factors on students' acquisition of mathematical language is mostly via their home environment and mental abilities. In other words, the effect of attitude toward mathematics, motivation and creativity on mathematical language acquisition is less than the effect exerted by home factors and students' mental abilities (comprehension, application, computation and reasoning). However, students attitude toward mathematics, their motivation to solve problem in mathematics and their creative behaviours are factors which affect, both directly and indirectly, their abilities to understand mathematical language variables such as terms, symbols, notations and readability.

Each of mathematical language, home background and problem characteristics exerts positive and significant influence on problem-solving ability. The total effect of mathematical language on problem-solving ability is .530 while the direct and indirect effects are .342 and .188, respectively. The direct effect in this case is

greater than the total indirect effect. The indirect effect is via home factors and mental abilities. In the case of home factors, the total effect exerted on problem-solving ability is .361. The direct and indirect effects are .126 and .235, respectively. The total indirect effect is greater than the direct effect. The indirect effect is transmitted through mental abilities and mathematical language factors. As regards problem characteristics, the total effect is .247 made up of .106 and .141 as direct and indirect effects, respectively. This reveals that the indirect effect of problem characteristics on problem-solving ability is greater than the direct effect. The indirect effect is through mental abilities.

Students' affective behaviours have no direct causal relationship on their ability to solve problems in mathematics. Such influence is through an intervening variable—mathematical language.

The results obtained among the variables in the model provide evidence that the new path diagram is valid and also tenable in offering explanations for interrelationships between home environmental factors via intervening variables and students' problem-solving ability. Path analysis has, therefore, made it possible to organise the results of the study in a manner that could be easily interpreted. The results obtained also provide steps that could be taken to improve instruction in mathematics.

## CONCLUSION

The study was designed to investigate interrelationships among a set of variables, using path analysis. This became necessary because what appears to be a conflict between correlations and regressions in educational researches could be resolved with path analysis, if a valid model could be developed. On the basis of this, a six-variable path analysis model was developed. The results obtained show that cognitive abilities, mathematical language, home background variables and problem characteristics in descending order of magnitude exert positive and significant effects on students' problem-solving ability. Students' affective behaviours do not have causal influence on their ability to solve problems in mathematics.

However, an experimental study is needed to confirm or otherwise whether direct manipulation of the variables in the model in specific schools would produce the desired effects. Additionally, a new path analysis model, using the confirmatory approach, is needed to bring into perspective the results of previous studies that have relevance to students' mathematics achievement in Nigeria.

## A PATH-ANALYSIS MODEL OF MATHEMATICS PROBLEM-SOLVING

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## Conceptual Learning and Research Possibilities: Bruner's View

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CONCEPTUAL learning or concept learning forms by far the most important part of every academic discipline. As concepts in each discipline are arranged in a hierarchy, the acquisition of lower order concepts aids in acquiring higher order concepts. Compared to students lacking conceptual clarity, students with conceptual clarity and understanding progress through a discipline at an accelerated rate. More importantly, concepts acquired with understanding serve as tools not only for acquisition of new concepts but also for solving problems. Realisation of the importance of conceptual learning has brought into limelight Bruner and his ideas on teaching and learning of concepts. This paper examines critically 'concept' of concept and seeks to explain what conceptual learning is. It further describes

Bruner's ideas on the nature and acquisition of concepts and strategies that can be used in concept attainment. These have been followed by a brief description of Concept Attainment Model (CAM) based on Bruner's ideas and a review of researches conducted during the last six years. Suggested possibilities for further research form the closing part of this paper.

#### CHANGING CONCEPT ABOUT CONCEPT

Concept has been variedly defined as:

- (a) "the acquisition of a mediating process that can be abstracted from the stimulus objects"

(Osgood, 1953)

- (b) "a class or grouping response—an act of categorization, of 'rendering equivalent'. The act of categorization involves rendering discriminably different things equivalent, to group the objects and events and people around us into classes, to respond to them in terms of their class membership rather than their uniqueness".

(Bruner et al., 1956)

- (c) "an elaboration, a unitary generic idea referring to a class of objects".

(Ausubel, 1961)

- (d) "the label of a set of things that have something in common ... a situation in which a subject learns to make an identifying response to members of a set of not completely identical stimuli".

(Hunt, 1962)

- (e) "an abstraction from a series of experience which defines a class of objects".

(Carroll, 1964)

- (f) "a class of stimuli which have common characteristics. These stimuli may be objects, events or persons".

(Dececco, 1968)

It may be observed that one common characteristic feature running across all the definitions given above is that there is an abstraction process in which similarities in objects are stressed and differences in them are ignored.

#### *Conceptual Learning*

Generally people use the word 'conceptual' in a broad sense to refer to the kind of behavioural change that is often verbal in its expression. To be precise, it refers to change in the symbolic or representational capabilities of the learner. According to Hunter (1924) the term 'conceptual' refers to internalised symbolic or representational processes as opposed to the routine or habitual ones.

## BRUNER'S IDEAS ON THE NATURE OF CONCEPTS

Bruner identifies three types of concepts: conjunctive, disjunctive and relational. These three types of concepts result from a combination of attributes in three different ways.

### (i) *Conjunctive Concepts*

A conjunctive concept is defined by the joint presence of criterial values of attributes which may range from two to several. Examples of conjunctive concepts are apple, triangle, horse, bay, money, magnetic substance, noun, etc.

The conjunctive concepts are often easiest to learn and teach because of the additive quality of their attributes and values.

### (ii) *Disjunctive Concepts*

A disjunctive concept is defined by the presence of any one or all or any combination of the criterial/defining attributes. In other words, these concepts are defined by either-or characteristics. According to Bruner et al. (1956, 156), what makes a class disjunctive is the manner in which one can use the defining attributes of objects to determine whether or not they are indeed members of the class—whether they are edible, good for bridge-building, or allergy producing. Members of a disjunctive class exhibit defining attributes such that one or another of these attributes can be used in identifying or categorizing them. Thus the class of substances capable of producing an identical allergic reaction in an individual may include either cut hair or chalk dust or repair ink. A substance containing any one or any combination of these defining attributes is necessary and sufficient for producing the class defining effect. The “allergy producers” is a disjunctive concept.

According to Bruner et al. (1956, 156-157), what is peculiarly difficult about attaining a disjunctive category is that two of its members, each uniform in terms of an ultimate criterion, may have no defining attributes in common. Two positive instances of the class, “allergy producers”, may be as different as chalk dust from cat fur, sharing nothing save their like effect on an organism. The problem-solver faced with the task of discovering the defining attributes of such a class must, if he is to succeed, abandon the conventional strategies of attempting to isolate those features that are common to all members of the class, for, in disjunctive class, there are no such universal common features. As in disjunctive concepts, all the members do not share the same defining attributes, the teaching-learning process involved in dealing with them differs from those with conjunctive concepts. To locate the properties of a disjunctive concept, one has to work backwards by focussing on an instance of what the category is not.



### *(iii) Relational Concepts*

Relational concepts are defined by specifiable relationship between defining attributes. For example, distance and direction are relational concepts. Other examples of such concepts are time, many, few, average, longitude, mass, weight, the same as ratio, per capita income, value, inflation, etc. It is to be noted that in relational concepts, it is not the commonness of attributes that matters but the particular relationship of the attributes.

Dececco (1968) exemplifies it by stating that both the concept 'distance' and the concept 'direction' have as their attributes points in space and time. What distinguishes them is the difference in the relationship of the same attributes. In 'distance' two points are related to each other because of separation. In contrast, in 'direction' the points are related through movement from one point to another.

In the teaching of relational concepts it is the unique relationship amongst the attributes that requires to be clarified to the pupils.

## ANALYSIS OF A CONCEPT

In accordance with Bruner's theory, conceptual learning involves knowing the elements of a concept. Six such elements have been identified. These are: (i) Concept name, (ii) Essential criterial attributes, (iii) Non-essential attributes, (iv) Positive examples, (v) Negative examples/exemplars, and (vi) Rule.

### *(i) Concept Name*

Concept name is the word used to symbolize a given concept. However, concept name is not synonymous with the concept, it is not the concept itself. A concept is an idea or an abstraction that exists in people's minds while concept name is the word that we arbitrarily use to designate a concept. It is perhaps this distinction that made Shakespeare say, "A rose called by any other name would smell as sweet".

### *(ii) Essential Attributes*

Before understanding the meaning of the term 'essential attributes' or 'criterial attributes', it is necessary to understand the meaning of the terms 'attributes', 'attribute value', 'range of attribute values', etc.

(a) *Attribute*: The term 'attribute' refers to a basic category, characteristic of a concept such as form, colour, size, shape, weight, etc. For example, in case of concept 'fruit', the attributes are colour, size, weight, shape and cost. An attribute varies from concept to concept. For example, the concept 'orange' differs from the concept 'apple' in colour smell, taste, etc.

(b) *Attribute Value*: Attribute value refers to the specific content of an attribute. For example, colour which is an attribute may have several values: red, blue, yellow, etc. Similarly, form, another attribute, may have several values: rectangular, triangular, square, etc.

(c) *Variation in Attribute Value*: The variation in the value of an attribute may be continuous or discrete. For example, the colour/shape of an orange shows variation along a continuum. The colour of orange can vary from red-orange to orange-yellow. Similarly, there are different degrees of roundness of oranges. However, those attributes which have discrete variations in values do not have continuity. In other words, they have discontinuity. For example, one of the simplest discrete attribute dimensions is a binary one: a man may be married or single, dead or alive, and in the eye of the law he is sane or insane.

Some attributes may not show any variation. For example, in case of the concept 'round disc' the attribute of shape does not have a range as the records are exact circles.

(d) *Number of Attributes of a Concept*: The number of attributes varies from concept to concept. 'red triangle' has two attributes—colour and shape—while the concept 'three red triangles' has three attributes—number, colour and shape. The concept 'apple' has many attributes: colour, size, form, texture, smell, taste, etc. Abstract concepts like 'democracy', 'socialism' too have many attributes. Just as the number of attributes varies from concept to concept, so do the criterial attributes associated with a concept.

(e) *Dominance of Attributes*: Some attributes are more dominant than others. For example, physical location is more dominant than attributes of colour and form.

John Wallace (1964), quoted in Dececco (1968, 390), discovered that students learn concepts with dominant attributes with significantly fewer examples than concepts with obscure attributes. For engaging the attention of pupils to obscure yet important attributes, a teacher may bring about variation in stimulus through the use of gestures, focussing, audio-visual switching, etc. so as to draw attention of pupils to obscure features.

Having understood the related terms, let us now discuss criterial attributes. According to Bruner (1956, 26), when the same discriminable feature of an environment is used as a means of inferring the identity of something, it is said to be a criterial attribute. For example, 'bark' and 'howl' are criterial attributes of the concepts 'dog' and 'jackal', respectively, as they help in establishing their identity. It may be pointed out that these criterial attributes have value-range like other attributes.

Thus the criterial attributes of a concept comprise distinguishing attributes along with their value-range. One or more criterial attributes may be present in a concept. If any one criterial attribute is missing from an object, the object is an example of

a different concept. Thus what makes us distinguish one concept from another is a criterial attribute or a combination of such attributes.

*(iii) Noisy/Non-essential Attributes*

According to Bruner (1956, 48), any attribute whose testing distracts or delays the discovery of a set of defining attributes is a noisy attribute. For example, while distinguishing different makes of motor cars by their appearance, the colour of cars would be a non-defining noisy attribute. As it varies from instance to instance, it may require testing as a relevant, but not as a defining attribute. Similarly, while presenting exemplars of a concept in statement form, the length of the sentence will be a non-essential attribute. Likewise, the form of packaging is a non-essential attribute in the concept of 'apple' or 'orange'. According to Bruner, all conceptual learning rests on knowing which features are non-essential. For a teacher the acid test of finding out whether students have attained the concept is to determine whether they describe the concept in terms of essential attributes and whether they distinguish examples from non-examples.

*(iv) Positive/Negative Examples*

Examples play a very significant role in the teaching of concepts. Examples are divided into two categories: positive and negative.

Positive examples contain all the information necessary for learning a concept. In other words, they contain a criterial attribute or a combination of criterial attributes of the concept. To be effective, these examples need to be so formulated that the information contained in them is observable by the pupils.

Negative examples, by contrast, do not contain one or more of the criterial attributes of the concept to be taught. As such, they are helpful in distinguishing essential attributes of the concept from those which are non-essential.

*(v) Rule*

A rule is a definition or a statement specifying the attributes of a concept. It helps to determine set inclusion and set exclusion. In other words, a rule contains distinguishing features of the concept which differentiate it from other concepts.

It may be pointed out that a thorough concept definition relates a concept to a more inclusive concept or set and then lists some distinguishing characteristics which differentiate it from other concepts in the set. These features may be seen from the definition of 'adjective' given below: Adjective (concept) is defined as a word (more inclusive concept) that modifies a noun or a pronoun (underlined words describe criterial attributes).

## BRUNER'S VIEW ON ACQUISITION OF CONCEPTS

As stated earlier, for Bruner concept learning is a form of categorization. According to him, categorization activity actually has two components, the act of 'concept formation' and the act of 'attainment'.

Concept formation is the act/process of sorting of given observations of phenomena into meaningful classes. The organism creates classes called concepts, taking into account observations on some basis meaningful to him. The basis can be affective, functional, or formal. Concept attainment, on the other hand, is an act/process of finding out defining or criterial attributes of given classes, that is, identifying "exemplars" and "non-exemplars" of a given category. As Bruner says, "Attainment refers to the process of finding predictive defining attributes that distinguish exemplars from non-exemplars of the class one seeks to discriminate". In concept formation, the examples of a concept are grouped together; in concept attainment, the negative and positive examples are tested and searched for their features.

According to Bruner, for the task of concept attainment to begin, the subject must have already formed some concepts. Thus it may be said that concept formation is the first step towards concept attainment.

## STRATEGIES IN CONCEPT ATTAINMENT

While attaining a concept, the subjects use various strategies. Bruner et al. (1956, 54) define strategy as "pattern of decisions in the acquisition, retention and utilisation of information that serves to meet certain objectives". Some of the objectives of a strategy for concept attainment will be following:

- (a) Ensuring that concept will be attained with a minimum number of encounters with relevant instances;
- (b) While attaining a concept, the amount of strain on inference and memory capacity will be minimised;
- (c) Prior to attainment of the concept, the number of wrong categorizations will be minimised.

In identifying the strategies the subjects use to attain concepts, Bruner et al. (1956) distinguish between the two learning conditions of 'selection' and 'reception'. In the selection condition the subject looking over an array of unlabelled examples may select instances in such a way as to isolate easily and efficiently the attributes that are useful in inferring the concept. In the reception condition the subject encounters labelled exemplars and non-exemplars of the concept he is trying to attain.

The type of instructional condition (selection or reception) influences a particular thinking strategy that the subject will employ. Bruner et al. (1956) have identified six strategies—four selection and two reception strategies. The four selection strategies are:

- (a) Simultaneous scanning
- (b) Successive scanning
- (c) Conservative focusing
- (d) Focus gambling.

It is to be noted that the first two are scanning strategies, the last two, focus strategies. They differ from each other in that the former test the concept hypothesis, while the latter, only the relevance of attributes.

In simultaneous scanning the subject simultaneously holds all possible hypotheses in mind, using each instance encountered as an occasion for deducing which hypotheses remain tenable and which must be eliminated, until all but the correct concept or appropriate hypothesis have been eliminated.

In successive scanning, only one hypothesis is tested at a time. The subject follows it through until it is proved to be either correct or incorrect. If it proves to be correct, the solution is reached and the process terminates. If it turns out to be incorrect, he would drop the hypothesis and go on to test the next one.

On comparing these strategies, it is noticed that simultaneous scanning imposes a heavy load on memory, while successive scanning avoids it, but the alternative price paid is redundancy of effort.

In conservative focusing, the subject tests one attribute at a time, while in focus gambling he tests more than one attribute at a time. Obviously, the former is a slower but sure steady procedure. By contrast, the latter is a quicker way for arriving at the concept in one or two moves, but if unsuccessful, he is penalised by having to start all over again. Thus, conservative focusing minimises the amount of risk involved while focus gambling takes a chance on it.

According to Bruner et al. (1956), two reception strategies in concept attainment are 'wholistic' and 'partist'. The wholistic strategies are similar to the focusing strategies of the Selection Model. In this strategy the subject takes the first positive instance as a focus and uses it in toto as an initial hypothesis. He compares all the attributes of the first instance with those of the subsequent instances. So long as the next instances, whether positive or negative, confirm the hypothesis, the hypothesis is maintained. When a positive infirming instance is encountered, the 'intersect' rule is followed. That is, the subject selects the common features of the current hypothesis and the positive infirming instance and uses it in forming a new hypothesis.

The partist strategy is similar to the scanning strategies of the Selection Model. In this strategy, the choice of a hypothesis is based on only a part of the initial

exemplar/instance. As long as the next exemplars also exhibit this feature, the hypothesis is retained. Or if non-exemplars do not show it, it is retained. But as soon as an instance infirms the hypothesis, the hypothesis is changed. While formulating a new hypothesis, the partist refers back to all previous instances so that it is consistent with them.

On comparing the use of the wholistic and partist strategies, the following differences have been found out:

- (a) The partist strategy makes more demand on memory and inference than does the wholistic strategy.
- (b) In the wholistic strategy, the possibility of the occurrence of negative infirming case is ruled out while in the partist strategy, it is not so.
- (c) Following the partist strategy, a subject has to be alert to all the characteristics of the instances he is encountering. This is not required of a subject following the wholistic strategy.

Bruner et al. (1956, 132) are of the view that it is possible for a subject to make use of the simultaneous process in the reception strategy in concept attainment. In this process, the subject attempts to use each instance to make all possible inferences about the correct concept. This process is similar to the simultaneous scanning strategy described earlier because all alternative possible hypotheses are entertained simultaneously.

Bruner et al. found that most people, under reception conditions, are wholists in their initial approach to the problem but tend to follow up with focusing (the use of attributes); whereas those who are partists follow up with scanning (the use of hypotheses).

### CONCEPT ATTAINMENT MODELS

Concept attainment models have been developed by Bruce Joyce and Marsha Weil on the basis of Bruner's views on conceptual learning and findings of research studies undertaken on them. There are three concept attainment models: The Reception Model, the Selection Model and the Model for Unorganized Material. A brief description of each is given below.

#### *Reception Model of Concept Attainment*

This model is characterized by more direct teaching of the elements of a concept and their use in concept attainment. The phases and activities of the model (Weil et al. 1978, 40) are as under:

*The Reception-oriented Concept Attainment Model:* The phases and activities of the Reception Model of Concept Attainment are outlined in Table 1.

TABLE 1  
Syntax of the Reception Model of Concept Attainment

Phase One Presentation of Data and Identification of the Concept	Phase Two Testing Attainment of the Concept	Phase Three Analysis of Thinking Strategies
Present labelled examples. Compare attributes in positive and negative examples. Generate and test hypotheses. Name the concept. State a definition according to the essential attributes.	Identify additional unlabelled examples as 'yes' or 'no'. Generate examples.	Describe thoughts. Discuss the role of hypotheses and attributes. Discuss type and number of hypotheses. Evaluate strategies.

*Principles of Reaction:* During the initial phases of the lesson, the teacher wants to support the student's hypotheses, emphasizing, however, that they are hypothetical in nature. In the later phases, he turns their attention towards the analysis of their concepts and strategies and encourages them to do so. His effort is directed towards the analysis of the merits of the various strategies rather than seeking one best strategy for all persons in all situations.

*The Teacher's Role:* The teacher has to play many important roles in this model. First, as the content in their books and other sources is not available in the form required by reception-oriented concept attainment model, he has to do it himself. For teaching a concept, the teacher has to select the content, organise it into positive and negative examples, and sequence them appropriately. Secondly, while using the model in the classroom, the teacher has to perform three important functions, viz. (i) keeping record/tract of hypotheses as they are mentioned and of the attributes; (ii) prompting them so that they come out with more hypotheses, and test them; and (iii) presenting additional examples.

*Support System:* Concept attainment lessons require materials that have been designed so that concepts are embedded in the materials, with positive and negative exemplars that can be pointed out to the students.

### *Selection-oriented Concept Attainment Model*

The major difference between the reception and the selection model arises in the labeling and sequencing of examples. In the selection model, an example is labelled after the student has asked whether it is a 'Yes' or 'No'. Moreover, the sequence of examples is also determined by the students as they themselves choose from amongst several examples the one they want to inquire about.

In general, the selection model places responsibility for concept attainment on the students. The various phases and activities of the model (Weil et al. 1978, 43) are given in Table 2.

TABLE 2  
Syntax of the Selection Model of Concept Attainment

Phase One Presentation of Data and Identification of the Concept	Phase Two Testing Attainment of the Concept	Phase Three Analysis of Thinking Strategies
Present unlabelled examples. Students inquire which examples, including their own, are positive ones. Generate and test hypotheses. Name the concept. State its essential attributes.	Identify additional unlabelled examples. Students generate examples.	Describe thoughts. Discuss the role of hypotheses and attributes. Discuss type and number of hypotheses. Evaluate strategies.

### *Unorganized Material Model*

This model is used in understanding the concepts and their attributes in un-arranged material. In other words, one tries to understand concepts or ideas by identifying the defining features people associate with them.

The procedure for analyzing concepts in unorganized material involves (i) locating the concepts; (ii) identifying the attributes being used; (iii) discussing the adequacy and appropriateness of attributes; and (iv) comparing exemplars to other data using the same concept.

### SOME RESEARCH STUDIES ON CONCEPT ATTAINMENT MODELS

Research studies related to any model of teaching can be broadly categorized into two groups: (a) developmental studies, and (b) effective studies. Developmental research studies form the basis of models of teaching. Various components of a model and their sequence are based on research findings. On the other hand, effectiveness studies pertain to testing of efficiency and effectiveness of a model in comparison to some other model or technique. As focus of attention is shifting to teaching and instruction these days, more and more studies of the latter type are being undertaken by researchers. Some of these studies are as under.

Chittrive (1983) conducted a study titled "The Evaluation of Differential Effectiveness of Ausubel and Bruner Strategies for Acquisition of Concepts in Mathematics". The study sample consisted of three groups of XI grade students who were randomly assigned to three treatments—Bruner, Ausubel, and Conventional. Six broad concepts of Mathematics were chosen. Twenty lessons were prepared on each of the three strategies involving the broader concepts and their sub-concepts. It was found that the mean scores on the conceptual knowledge test of Bruner and Ausubel groups did not differ significantly. In other words, both the strategies were equally effective for teaching concepts at knowledge level. However, on a test to



measure enhancing concept transferability, Ausubel's strategy was found to be superior to Bruner's. In contrast, on a test designed to measure student's abilities to discover new relationships and to retain knowledge of the concepts (long and short term), Bruner's strategy was found to be superior than Ausubel's strategy. Further, it was found that Ausubel's strategy suited categorical style students while Bruner's strategy was more effective with conceptual style ones.

Jainini (1986) conducted a study titled "Effectiveness of Concept Attainment Model in Developing Certain Concepts of Chemistry at Senior Secondary Level". She used the reception model of concept attainment in her study. She selected 40 students of Class XI as her sample and divided them into two equivalent groups ( $N = 20$  each) on the basis of their scores in the terminal tests. The two groups were assigned to treatments viz. teaching of concepts by the traditional Method and by the Concept Attainment Model (CAM) on random basis. The traditional method comprised of lecture-cum-demonstration.

The study followed the pre-test-post-test parallel group design.

It was found that the difference in the mean gain scores of the pupils taught through CAM and those taught through the traditional method was significant at .05 level. Another finding was that the mean loss in gain scores after a gap of one month suffered by the pupils taught through the traditional method was higher than that of the group taught through CAM and that this difference was significant at .01 level of significance.

Mehra (1986) conducted a study titled "Effectiveness of Concept Attainment Model (Reception Strategy) of Teaching in Developing Some Concepts of English Grammar at the Middle Level". This study was similar to Jainini's study except that each sample group consisted of 25 pupils of Class VII and that the content comprised some concepts of English Grammar.

It was found out that the difference in the mean gain score of the pupils taught through CAM and of the pupils taught through the traditional method was significant at .01 level. Another finding was that after one month the mean loss in the gain scores suffered by the group taught through the traditional method was more than that by the group taught through CAM and that this difference in loss in the gain scores was also significant at .01 level.

Srivastava (1987) conducted a study titled "Effectiveness of Concept Attainment and Biological Science Inquiry Models for Teaching Biological Science to VIII Class Students". The sample consisted of 78 female students of Class VIII in the age-group of 13-14 years. The students were divided into three groups and each group was assigned to one of the three treatments—CAM, Biological Science Inquiry Model and Conventional Teaching. The study revealed that the three treatments had differential effects on the achievement of the students. CAM was found to be more effective than the Biological Science Inquiry Model and Conventional Teaching.

tional Teaching. Besides, the study revealed that three treatments also had differential effects on attitude change. CAM changed the attitudes more favourably than the Biological Science Inquiry Model and Conventional Teaching.

Aggarwal and Misra (1988) conducted a study titled "Effectiveness of Reception Concept Attainment Model of Teaching for Enhancing Attainment of Science Concepts". The sample of this study consisted of 36 girl students studying in Class VII. They were randomly assigned to two groups—the control group and the experimental group. Thus each of the two groups had 18 students.

The study followed the randomized control group pre-test-post-test design. The experimental group was taught through the two-phase reception concept attainment model of teaching and the control group, through the traditional method. A concept attainment test consisting of 24 items was used to measure the students' attainment. Fifteen items of the test tested knowledge and understanding while nine items tested application. The difference between the pre-test and post-test scores of every student was found and this gain score was treated as the Concept Attainment Enhancement (CAE) score. The Mann-Whitney U Test was used to test the significance of differences in enhancement of concept attainment among the experimental and control group subjects. It was found out that overall CAE as well as CAE related to the knowledge, and understanding objectives of the experimental group subjects was significantly better than those of the control group subjects, but in case of CAE related to the application objectives, the two groups did not differ significantly. It was concluded that the reception concept attainment model of teaching is an effective teaching strategy for helping students in better attainment of science concepts.

The studies reviewed above, though small in number, reveal that CAM is more effective than the conventional method for (i) teaching of concepts especially at knowledge and understanding levels; (ii) retention of concepts; and (iii) bringing about attitudinal changes. There is, however, a dearth of research studies that provide conclusive evidence with regard to the effectiveness of Bruner's concept attainment model over other teaching strategies in teaching a variety of concepts at different levels to pupils of different abilities studying in different grades.

#### RESEARCH POSSIBILITIES

Research studies on models of teaching have an obvious bearing on teacher education. On the one hand, they are helpful in the development of theories of teaching which, according to Gage (1963), should answer three questions: How teachers behave, why they behave as they do, and with what effects? On the other hand, by examining the actual working of a model in real classroom situations and its comparative effectiveness vis-a-vis that of other models, they highlight the

conditions under which a model gives optimum results. Some of the areas of research which may enhance capabilities of teachers to adapt CAM to the instructional needs of the pupils are suggested below:

- (a) Studies may be conducted to find out the strategy (ies) used by the different categories of pupils to attain concepts when taught through CAM. The pupils may be categorized on the basis of age, grade, achievement motivation, socio-economic status, creativity, etc.
- (b) Efficiency and effectiveness of CAM for teaching concepts in different disciplines at various grade levels may be compared with other models of teaching concepts.
- (c) Studies may be conducted to find out the loss of learning suffered by the various categories of pupils taught through CAM at different intervals of time. Similarly, studies comparing the loss of learning suffered by the various categories of pupils taught by the different models of teaching concepts may be also undertaken. The thrust of such studies would be to assess the learning through the various models/strategies for concepts and their relative efficiency in terms of retention over varying periods of time.
- (d) Studies may be designed to find out the strategies used by pupils and teachers who have been exposed to CAM while gaining understanding of new concepts on their own.
- (e) Studies may be undertaken to find out the preferences of the different categories of pupils for CAM vis-a-vis other strategies/models. Likewise, studies comparing the preferences of the different categories of pupils for the different models of teaching concepts may also be undertaken.
- (f) Of the three concept attainment models, most of the research studies have been conducted on the reception-oriented model. Research studies need to be undertaken in the area of other concept attainment models too.

This description of research possibilities using CAM is just an illustrative and not an exhaustive one. Emergence of newer vistas—psychological as well as pedagogical—in teacher education is bound to further increase such possibilities.

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## Stage Structure of Teacher-educators in Moral Judgement.

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INDIA has always remained concerned with the teaching of morality. In the Ashrams enough attention was paid to the development of morality. After independence, various commissions and committees set up by the state have recommended the inclusion of moral education in the system of education (Religious Education Committees of CABB, 1946; University Education Commission, 1948-49; Secondary Education Commission, 1952-53; Committee on Religious and Moral Instruction, 1959; Education Commission 1964-66; Committee of Members of Parliament on NPE, 1967). The National Policy on Education (1986) suggested to "make education a forceful tool for the cultivation of social and moral

development". The moral development of teachers depends on the moral development of teacher-educators.

### THEORETICAL BACKGROUND

In the field of moral development, Kohlberg's theoretical and empirical research has received a great deal of attention. He carried out his study in several countries. He elaborated Piaget's work (1932) into a scheme of six developmental stages. He classified these six stages into three levels:

1. Pre-conventional Level: Subject conforms to authority based on physical consequences: exploits loopholes in power structure.
2. Conventional Level: At this level subject is interested in conforming to social order and in maintaining and justifying the orders.
3. Post-conventional Level: Trust towards autonomous moral principles, valid apart from authority and without identification with authorities.

TABLE 1 Kohlberg's Stages of Moral Development			
Level		Stages	
A.	Pre-conventional Level	1	Punishment and Obedience Orientation
		2.	Instrumentalist/Relativist Orientation
B.	Conventional Level	1	Interpersonal Concordance
		2.	Law and Order Orientation
C.	Post-conventional Level	1	Socio-contract Legalistic Orientation
		2.	Universal Ethical Principle Orientation

A brief description of Kohlberg's (1975) stages of moral development is as follows:

**STAGE 1. *Punishment and Obedience Orientation:*** Avoidance of punishment and unquestioning obedience to authority are valued. Physical consequences determine goodness or badness of one's act.

**STAGE 2. *Instrumentalist/Relativist Orientation:*** The idea of reciprocal arrangements between people is viewed at this stage. Satisfaction of one's own needs and occasionally the needs of others is considered right.

**STAGE 3. *Interpersonal Concordance:*** Good behaviour is that which pleases or helps others. The tendency is to conform to the role of a good boy or a good girl or to be nice. Behaviour may be seen as intentional and is frequently judged by intention.

**STAGE 4. *Law and Order Orientation:*** At this stage, there is movement away from individual intention to authority, fixed rules, and maintenance of a general

social order. Right behaviour consists of doing one's duty, showing respect for authority and maintaining social order. Respectability comes from doing one's duty.

**STAGE 5. *Social Contract, Legalistic Orientation:*** Right action is defined in terms of individual rights and awareness is shown of the relationship of personal values and opinion and the need for rules to reached agreement. At this stage, rules are critically examined and agreed upon by the society. Duty is defined in terms of contract with others, particularly the majority.

**STAGE 6. *Universal Ethical Principle Orientation:*** Right is defined as a decision of conscience in concurrence with universal ethical principles. At this stage rules are not concrete moral rules but universal principles conforming to human equality, reciprocity of human right and respect for individual. The self-chosen ethical principles are comprehensive, universal, consistent and abstract. Conscience is a directing agent of mutual respect and trust, built on the dignity of human beings as individual persons.

#### OBJECTIVES

The objectives of the study were:

1. To find out the moral judgement profile of teacher-educators.
2. To determine the Principled Morality Index of teacher-educators.
3. To study the Principled Morality Index according to sex and qualifications.

#### HYPOTHESES

The following hypotheses were formulated for the present study:

1. There exists no significant difference in the Principled Morality Index of male and female teacher-educators.
2. There exists no significant difference in the Principled Morality Index of Science and Humanities Stream teacher-educators.
3. There exists no significant difference in the Principled Morality Index of Ph.D. and non-Ph.D. teacher-educators.

#### TOOL

The Defining Issues Test (DIT) was used to measure the moral judgement development of teacher-educators. Moral judgement development as measured by DIT provides a basic conceptual framework by which a subject analyses a socio-moral problem. Later on, the subject makes a judgement for an appropriate course

of action. Therefore, DIT is a situational test. It contains six situations/dilemmas. Each dilemma is followed by 12 questions. The subjects are expected to assess the relative importance of each question. Finally, the subject is expected to select four most important questions and rank these.

The face validity for the test was established as the DIT task involves problems. The reliability of the test as determined by the test-retest method is .70 (Davison and Robbins, 1978). The Cronbach's alpha index of internal consistency is more than .70 (Rest, 1974). The tool provides stages of moral judgement development. The Principled Morality Index ('P' scores) is the sum of weighted ranks given to stage 5 and 6 items. The 'P' score is interpreted as "the related importance a subject gives to Principled morality considerations in making a decision about moral dilemmas". The tool also gives anti-establishment score (Rest, 1979).

### SAMPLE

The sample for the present study comprised of 20 male and 11 female teacher-educators from 11 states. Thirty-one teacher-educators participated in the study. The participants were invited for a workshop and data were collected from them. Twenty-one teacher training colleges and four university departments were represented on the sample. Stream-wise, 13 teacher-educators were from the science and 18 from the humanities stream. Ten teacher-educators were Ph.D. and 21, non-Ph.D.

### RESULTS AND DISCUSSION

The data collected from the teacher-educators were analysed. The stages of moral judgement were determined and the results are presented in Table 2.

Stage	2	3	4	5	6
Mean (percentage responses)	6.98	20.64	33.00	25.33	7.24
SD	4.53	9.25	10.10	9.76	4.42

It is evident from Table 2 that the means of Stages 2, 3 and 4 are in increasing order, with 6.98 per cent responses for Stage 2, 20.64 per cent for Stage 3, and 33 per cent for Stage 4. Stage 5 responses are 25.33 per cent and those of Stage 6 are 7.24 per cent. Thus, it clearly indicates that the teacher-educators generally operate



on Stage 4—Law and Order Orientation. If the responses of Stage 3 and Stage 4 are taken together, the total indicates that the 53.64 per cent teacher-educators operate on the conventional level. The post-conventional level percentage is 32.57. It may be inferred that in the area of moral judgement, after conventional level, the teacher-educators operate on the post-conventional level. It may be pointed out here that Stage 6—Universal Ethical Principle Orientation—responses are 7.24 per cent, which is nearly equally to Stage 2—Instrumentalist/Relativist Orientation—responses (6.98 per cent).

TABLE 3 Principled Morality Index of Different Sample				
Sample Description	N	Average % Index	SD	't'
<i>Sex</i>				
All	31	30.67	10.45	
Male	26	32.33	12.44	1.42
Female	11	27.73	5.44	(NS)
<i>Stream</i>				
Humanities	18	25.28	9.24	2.95*
Science	13	36.65	11.46	
<i>Research</i>				
Ph.D.	10	31.83	15.80	0.32
Non-Ph.D.	21	30.16	7.48	(NS)
* Significant at .01 level NS = Not Significant				

Table 3 represents the Principled Morality Index for different combinations of the sample. The Principled Morality Index is 30.67 per cent for the entire sample. The Principled Morality Index of male is 32.33 per cent and for female, it is 27.75 per cent. The 't' value was calculated to test the null hypothesis. The 't' value is 1.42 which is not significant. It may be inferred that there exists no significant difference in the Principled Morality Index of male and female teacher-educators. Moral judgement development of male and female teacher-educators is similar because all of them have the same academic qualifications. Besides, their cognitive development may be similar. Hence, there is no difference in their moral judgement. Here it may be pointed out that boys and girls differ significantly on moral judgement (Gupta, 1982).

The teacher-educators were grouped for their subjects at post-graduation. It was observed that the teacher-educators were either from the science or humanities stream. The Principled Morality Index for the humanities stream was 25.28 and for the science stream, it was 36.65. The 't' value was calculated to test the null hypothesis. The 't' value is 2.95 which is significant at .01 level. Thus the hypothesis that there exists no significant difference in the Principled Morality Index of science and humanities teacher-educators was rejected. This clearly indicates that teacher-educators of the science and humanities streams differ significantly in the Principled Morality Index. The Principled Morality Index for the science stream teacher-educators is higher than the humanities stream teacher-educators. It is difficult to explain the difference. However, in terms of observation power, reasoning and adherence to law, teacher-educators with science background may be better than those of the humanities stream.

A further classification of the sample was done to study the Principled Morality Index of Ph.D. and non-Ph.D. teacher-educators. The Principled Morality Index for Ph.D. teacher-educators is 31.6. The 't' value is .32 which is not significant. Thus the null hypothesis is retained. It is concluded that there exists no significant difference in the Principled Morality Index of Ph.D. and non-Ph.D. teacher-educators. The doctoral research work may not be contributing to the development of moral judgement.

TABLE 4 Anti-establishment Score of Teacher-educators			
Total Sample	Number of Teacher-educators	Mean	SD
31 (100)	25 (81)	7.78	5.22
Figures in parentheses represent percentages			

The Defining Issues Test also produced anti-establishment score. It is shown in Table 4. Out of 31 teacher-educators, 25 have anti-establishment score. The mean of the anti-establishment score is 7.78 and the standard deviation is 5.22. This clearly indicates that about 81 per cent teacher-educators are not satisfied with the present set-up (establishment). The manual did not indicate any other information about the anti-establishment score. Hence, it is an open question for the research workers, to take up further research in this area.

Table 5 presents the Principled Morality Index of Indian and foreign samples. It is evident from the table that the Principled Morality Index of Indian teacher-educators is 30.67 which is less than the Principled Morality Index of all foreign samples.

## STAGE STRUCTURE OF TEACHER-EDUCATORS

**TABLE 5**  
**Principled Morality Index of Indian and Foreign Samples**

Characteristics	N	Average % Index	SD
Indian teacher-educators	31	30.67	10.45
(Foreign) College faculty teaching dental hygiene (Anderson 1975)	29	46.9	N.A.
Women in continuing education programme at U of Toledo (Jacob 1975)	60	31.5	N.A.
Foreign-born and educated doctors in pediatrics residency programme (Sheeshan 1979)	97	32.8	13.2
Master's degree candidates in Education (Bloom 1976)	82	49.7	N.A.
Ph.D. (Philosophy) (Lawrence 1978)	30	56.8	7.8
Ph.D. (Moral Philosophy) (Rast 1979)	15	65.2	9.5
Teachers of teacher training colleges (McGeorge 1976)	92	44.2	13.5

### EDUCATIONAL IMPLICATIONS

The present study has implications for teacher-educators and society. It is evident from the research that development through the stages can be enhanced by stimulating cognitive conflict. The environment of teacher education colleges should be conducive to moral debate. It is desirable for teacher-educators to progress through the stages and attain principled morality.

Since the majority of teacher-educators in the present study operate at Stage 4—Law and Order Orientation—followed by Stage 5—Socio-contract Legalistic Orientation—there is need to develop certain effective programmes involving debates on moral issues, study of biographies and autobiographies of great persons. Further, this would be strengthened when principals/heads of institutions known for their moral standards are recruited.

Male and female teacher-educators are almost equal on the Principled Morality Index. The implication of this result is that programmes for moral development are equally important for both categories of teacher-educators.

The Principled Morality Index of teacher-educators of the science and humanities stream differs significantly. As teacher-educators with the science background are slightly better in the Principled Morality Index, in comparison to teacher-educators of the humanities stream, it would be worthwhile to concentrate more efforts on the development of morality through effective and meaningful programmes/strategies among teacher-educators teaching humanities.

There exists no significant difference in the Principled Morality Index of Ph.D. and non-Ph.D. teacher-educators. This finding implies that pursuing studies for

research degree at Ph.D. level hardly contributes towards the development of morality among teacher-educators.

The teacher-educators attained a certain stage in reasoning but the behaviours of their previous stage did not obliterate. The relationship between reasoning and behaviour is not conclusive. Therefore, teacher-educators to be careful in dealing with pupil-teachers.

The results of the study indicate that there is a need to restructure the teacher education programme by including the component of moral education in all the courses taught at the B.Ed. level or in other courses of teacher training.

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## Ph.D. Theses Abstracts

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*Interrelationship between Measures of Selected Guilford's S.I.  
Factors and Set Concept Achievement of Secondary Level  
Students of Delhi State*

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THE introduction of the new mathematics concepts in school mathematics during the sixties brought 'the second revolution' in the teaching of mathematics all over the world. Although these concepts were introduced in the courses of studies on the recommendations of various high level committees and conferences but it was lacking in sufficient systematic curriculum research concerning motivation, learning, development and behavioural characteristics of children. Besides, researches were also required on identification of intellectual abilities and articulation of subject content in modern mathematics with the abilities as identified at different levels, which may provide an empirical foundation for curricular changes.

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## HYPOTHESES

In order to secure some empirical evidence for the set concept component of the new mathematics and its relationship with certain selected Guilford's S.I. abilities, the present investigation was undertaken and in accordance with the objectives of the study, the following seven null hypotheses were formulated for testing:

1. There is no significant relationship between the measures of cognition and convergent production of semantic classes, relations and implications of Guilford's S.I. model.
2. There is no significant relationship between the various measures of set concept achievement.
3. There is no significant relationship between the measures of set concept achievement and reasoning ability.
4. The reasoning ability tests based on cognition and convergent production of semantic classes, relations and implications do not contribute more than ten per cent of the variance to the sum of the squares of the loadings of the factors rotated according to the varimax criterion.
5. The set concept achievement does not contribute more than ten per cent of the variance to the sum of the squares of the loadings of the factor rotated according to the varimax criterion.
6. The set concept achievement tests together with the reasoning ability tests do not contribute more than ten per cent of the variance to the sum of the squares of the loadings of the factor rotated according to the varimax criterion.
7. The measures of cognition and convergent production of semantic classes, relations and implications do not contribute significantly to the variance in the achievement of the set concept.

## TOOLS

In order to secure the measures of Guilford's S.I. factors—cognition and convergent production of semantic classes, relations and implications, *Tarka Kshmeta Parikshan Patra* (reasoning ability test) devised by Dr. Girishbala (1978) and consisting of 19 tests, was used. And in order to secure measures of achievement of set concept in the new mathematics, *Sammuchchya Sankalpana Samprapti Parikshan Patra* (set concept achievement test) consisting of six tests, was constructed by the investigator.

## SAMPLE

Data from a sample of 205 students of Class IX from Urban-area Hindi-medium Government Boys' Senior Secondary Schools were collected.

## ANALYSIS

Statistical techniques of correlation analysis, factor analysis and multiple regression analysis were used.

## FINDINGS

The findings of the data analysis are summarised as below:

1. Most of the reasoning ability tests had significantly low and positive correlations between themselves.
2. Intercorrelations between six set concept achievement tests ranged from 0.142 to 0.469.
3. Factor analysis of the intercorrelation matrix of nineteen reasoning ability tests resulted into identification of the following five factors:
  - Inductive reasoning or cognition factor
  - Education of classes and relations
  - Cognition of semantic implications
  - ~~Deductive reasoning or convergent production factor~~
  - Convergent production of semantic implications.
4. Factor analysis of the intercorrelations matrix of six set concept achievement tests resulted into extraction of the following two factors:
  - Concept of set
  - Concept of function.
5. Correlation between reasoning ability tests and composite of set concept achievement were all significant at .01 level, except one not significant. Concept of set had correlation values with seventeen reasoning ability tests significant at .01 level, with one at .05 level with one not significant. Concept of function had correlation values with eight reasoning ability tests significant at .01 level, with three at .05 level and with eight not significant.
6. Factor analysis of the intercorrelations matrix of nineteen reasoning ability tests together with composite set concept achievement shared significant loadings on deductive reasoning or convergent production factor and cognition of semantic implications factor. Larger variance was accounted

for by deductive reasoning or convergent production factor as compared with cognition of semantic implications factor.

Factor analysis of the intercorrelation matrix of nineteen reasoning ability tests together with achievement of the concept of set and the concept of function showed that the concept of set shared significant loadings on deductive reasoning or convergent production factor and education of classes and relations, while the concept of function shared significant loadings on cognition of semantic implications and convergent production of semantic implications factors. Larger variance was accounted for by deductive reasoning or convergent production factor on concept of set and convergent production of semantic implications on the concept of function.

7. Multiple regression analysis revealed that five tests, viz. Effects test, Figure Concept test, Association IV test, Syllogism III test and Sequential Association test contributed significant variance to the variance of composite set concept achievement. Three tests—Word Matrix test, Association IV test and Syllogism III test—contributed significant variance to the variance of the achievement of the concept of set and the figure concept test contributed significant variance to the variance of achievement of concept of function.

## RESULTS

The findings of the present investigation led to refutation of all the seven null hypotheses at .01 level of significance.

The study indicates that usually the emphasis of teaching in our schools is more on acquiring acceptable and correct information (deduction) rather than on understanding and information processing (induction). It suggests that a systematic effort right from the framing-up of the curriculum, based on specially defined learning tasks for desirable behavioural changes in pupils of specific age to the attainment level should be made. The development of suitable teaching-learning situations and procedure should be meticulously planned so as to realize these objectives. Further tools for formative and summative evaluation should be developed in order to assess the behavioural changes attained by the pupils at a particular age/stage or grade level. Finally, by employing immediate and continuous feedback devices through diagnostic and remedial methods, a proper balance should be brought about between both inductive (cognition) and deductive (convergent production) abilities among pupils through the formal education system.





## *Power Motive in Relation to Sex and Value Orientation*

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**M**OTIVATION plays a significant role in determining the behaviour of an individual. There are various motives which determine human behaviour. Power motive is one of them. Power motive is one of three fantasy-based motives developed by McClelland and his co-workers in 1950s. Veroff (1957) and Winter (1972) formulated their measures of power motive in terms of social forcefulness of the leadership.

Value orientation is also a greatly significant phenomenon in the life of an individual. Various values guide the behaviour of an individual. Of these, social, political and economic values are of special interest in relation to power motive.

The present investigation was an attempt to employ a particular method of measuring human motivation—a method which involves content analysis of imaginative thought sequences.

### OBJECTIVES

The present investigation was undertaken with the following objectives:

1. To examine power motive among post-graduate students, in relation to sex.
2. To study values among post-graduate students in relation to sex.
3. To study power motive among post-graduate students in relation to different courses of arts and science.
4. To study values among post-graduate students in relation to different courses of arts and science.
5. To examine the relationship between power motive, value orientation and sex.
6. To examine the relationship between power motive and value orientation among post-graduate students pursuing different courses of arts and science.

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7. To study the interaction between power motive and value orientation and also study the effect by sex and faculty.

#### HYPOTHESES

The following null hypotheses were formulated for the present investigation:

1. There is no significant difference between males and females on the power motive scores.
2. There is no significant difference between males and females in value orientation.
3. There is no significant difference between arts and science students on the power motive scores.
4. There is no significant difference between students of science and arts on the value scores.
5. There is no significant relation between the power motive scores and the value scores of male and female students.
6. There is no significant relation between the power motive scores of the students of science and arts faculties.
7. Power motive and values are not affected by sex and faculty students as well as interaction.

#### SAMPLE

The sample consisted of 200 students (50 male from arts, 50 female from science, 50 female from arts and 50 male from science faculty) studying in six post-graduate colleges of Rohilkhand University, Bareilly (U.P.)

#### TOOLS FOR DATA COLLECTION

The data in this study came through the following two tools:

1. T.A.T. pictures which were suggested by Veroff (1957)
2. Hindi adaptation of Allport Vernon's test, developed by Dr. R.K. Ohja (1972).

#### STATISTICAL TECHNIQUES

The study involved the use of the following statistical techniques: C.R. Values, Correlation and Analysis of Variance.

## RESULTS

The results of the present study are discussed below, hypothesis-wise:

1. The means of power motive for males and females are 48.27 and 51.85, respectively. The difference between two means is significant at .05 level. It indicates that female tend to be more power-motivated than male students.
2. There is no significant difference between males and females in the economic and political values but there is significant differences between them in the social values at .05 level.
3. The means of power motive for science and arts faculties are 52.57 and 47.85, respectively. The difference between two means is significant at .01 level. It indicates that science students tend to be more power-motivated than arts students at the post-graduate level.
4. In this investigation the null hypothesis is proved that there is no significant difference at any level among the students of science and arts faculties.
5. There is positive relationship between power motive and economic value among female students (.05 level), power motive and political value among male students (.01 level) and power motive and political value among female students (.05 level).
6. There is positive relationship between power motive and political value among science students (.05). Power motive is positively related to economic value among arts students (.05). Other relationships were not found to be significant at any level.
7. The contribution of sex towards variance is found to be significant at .05 level. The faculty differences also contribute significantly towards the variance in power motive at .01 level.

In brief, power motive is of vital importance for all human engineering in various organisations. Value orientation is of great significance in the life of an individual. Values direct the behaviour of an individual and affect it to a considerable extent.



*Development of Programmed Instruction in Linear and Branching  
Styles and Studying the Performance in Relation to Creative  
Thinking and Level of Aspiration*

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WITH the emergence of growing sophistication in behavioural sciences, efforts are being perpetually made to improve learning and classroom instruction. Programmed instruction in this respect opens new vistas for change since the current emphasis in the programmed instruction is to intensify the concern for improving the effectiveness of teaching by constructing material which will guide the pupil through a series of steps towards the mastery of specific learning problem.

The research studies carried so far in the field of programmed learning have found the effectiveness of programmed material on the performance of students. However, the effects of personality characteristics as well as intellectual abilities like creative thinking have not been included in these experimental investigations to empirically study the effect of programmed learning in relation to these variables.

Creativity is a complex and multi-dimensional phenomenon with no universally accepted definition and method for its evaluation. Rhodes (1961) analysed 50 definitions to indicate four strands of creativity: person, process, press and product. Lehois (1963) tried to combine the four strands by defining creativity as a complex human attribute that is manifested as a cognitive empirical process from which an original product emerges. Guilford (1956) and Wilson et al. (1954) laid emphasis on divergent production ability and worked out factors—fluency, flexibility, originality, elaboration and redefinition—constituting the concept of creative thinking.

A number of studies have been conducted to study the effectiveness of creativity on achievement. Gupta (1979), Asha (1980), Singh (1981) and Jarial (1981) found high creatives perform significantly better than low creatives. But Sandhu (1978) and Sharma (1981) did not find any difference between the performance of high and low creatives.

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Degree awarded by H.P. University (1987)

There is, however, considerable evidence to show that creativity affects achievement. But it still needs to be investigated as to how far creativity affects achievement attained through the study of programmed material.

Few studies have been conducted to find out the relationship of programmed instruction with creative thinking. Dacey (1967) found that instructional students did not receive significantly higher scores on any of the post-tests in verbal creativity than non-instructional students. However, Gupta (1981) concluded that high creatives perform better than low creatives in the understanding of social concepts through a linear programme showing that academic achievement is significantly related to the measure of creativity.

Aspiration has been accepted as one of the important variables of personality. In describing a person's level of aspiration we are in fact describing him. It is inalienably an expression of the self, of the subject's future or past orientation, his confidence in himself, his fear of failure, his optimism or pessimism, his ambition and his courage to face reality. For these and other reasons investigation of an individual's level of aspiration is an effective way of learning to understand his personality. The rationale of introducing level of aspiration in the present study is based upon the assumption that an individuals' level of aspiration has motivational property due to which it is intimately linked with the process of learning, thereby with the performance of learners. The studies conducted by Rai (1974), Tiwari and Rai (1976) and Sharma (1981) concluded that level of aspiration as a factor does not affect the performance of students. However, Vasanth Ram Kumar (1972) and Uniyal and Sah (1981) found the relationship of two variables.

Little work is reported in the literature that has attempted to study the variable of level of aspiration in relation to programmed instruction. Davis (1971) developed five self-contained programmes (Mathematics, English, Art, Science and Geography) written in a similar style and format. These programmes were tested on three levels of aspiration tests. In this study all the three measures of LOA significantly correlated with achievement. But Dwivedi (1982) found that level of aspiration as a factor does not influence performance in a linear programme presentation.

Due to inconsistent and inconclusive results of the studies stated above, it was thought to undertake the present study.

## OBJECTIVES

The study was undertaken to achieve the following objectives:

1. To develop two programmes, one in linear and other in branching formats, in a segment of science.

2. To study the performance of students on the criterion test in a segment of science, in relation to creative thinking.
3. To study the performance of students on the criterion test in a segment of science, in relation to level of aspiration.
4. To compare the efficacy of the linear and branching programme formats with reference to performance on the criterion test in a segment of science.
5. To study the interaction effects of creative thinking, level of aspiration and style of programming on performance on the criterion test in a segment of science.

### HYPOTHESES

The following hypotheses were framed:

1. Creative thinking significantly affects the performance of students on the criterion test in a segment of science taught through programmed material.
2. Level of aspiration does not affect the performance of students on the criterion test in a segment of science taught through programmed material.
3. The performance of students having undertaken a branching programme will be significantly higher on the criterion test than those having undertaken a linear programme in a segment of science.
4. There is no significant interaction effects of creative thinking  $\times$  level of aspiration; creative thinking  $\times$  style of programming; level of aspiration  $\times$  style of programming and creative thinking  $\times$  level of aspiration  $\times$  style of programming on the performance of students on the criterion test in a segment of science.

### DELIMITATIONS

The present study was delimited with respect to variables, content, sampling, tools and techniques at various stages.

The main variables of the study are creative thinking, level of aspiration and style of programming. Two sets of the programme were developed on the same content, i.e. 'structure of seed'. Each programme was further divided into four units and the behavioural objectives for all the units were written in advance.

### TOOLS USED

The following tools were used for the collection of data:

### *Test of Creative Thinking*

Verbal and non-verbal tests of creative thinking, developed by Mehdi (1973) were used to measure the creative potential of high school students.

### *Level of Aspiration Tasks*

Three levels of aspiration tasks were used for measuring the level of aspiration of the subjects namely—letter cancellation test, digit symbol substitution test and computation task developed by Muthayya (1959).

### *Programmed Texts*

Two programmes, linear and branching, developed and validated by the investigator (1986) for her Ph.D. degree were used.

### *Criterion Test*

Criterion test was also developed by the investigator to measure the pre-test and post-test scores of the students.

## PROCEDURE

The present study covered the target population of Grade IX students of high and higher secondary schools in District Mandi of Himachal Pradesh. The sample was drawn from the five high/higher secondary Hindi-medium schools in Mandi. The institutions and subjects were selected randomly and the size of the sample taken was 200. The subjects were divided into four groups on the basis of high and low creative thinking and level of aspiration. Each of the four groups was further divided into two—one taught through the linear programme and the other through the branching programme. Thus, in all, eight experimental treatment groups were formed, each consisting of 25 students.

The experiment was conducted in the framework of  $2 \times 2 \times 2$  factorial design. It involved two levels of creative thinking, two levels of aspiration and styles of programming. These constituted independent variables, while the amount of attainment recorded by the subjects on the criterion test was dependent variable.

The main and interaction effects of creative thinking, level of aspiration and styles of programming were analysed, following the technique of analysis of variance.

FINDINGS AND CONCLUSIONS

The following conclusions were arrived at:

1. High creatives perform significantly better than low creatives on the criterion test.
2. Level of aspiration as a factor does not affect the performance of students on the criterion test.
3. Both the programme formats are equally good in terms of their effect on the performance of students on the criterion test in a segment of science.
4. High creatives perform significantly better than low creatives on the criterion test in a segment of science irrespective of level of aspiration.
5. The difference between the performance of high and low creatives on the criterion test is approximately the same when they are taught either through the linear or branching programme.
6. Level of aspiration does not affect the performance of students when they are taught either through the linear or branching style of presentation.
7. Creative thinking, level of aspiration and styles of programming do not interact mutually. Hence the effect of creative thinking on the performance of students on the criterion test is independent of level of aspiration and styles of programming.

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## *Operational Reasoning and Concept Attainment in Physics*

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**M**AJORITY of science concepts taught at the higher secondary level are abstract and require formal thought for their understanding. It is reasonable to believe that formal-operational students, who are capable of hypothetical thought, will learn physics concepts better than concrete-operational students who reason from concrete objects and work with logical operations that refer to empirical reality. A large number of studies have reported that formal thinkers outperform concrete thinkers in science achievement and understanding of science concepts which are related to students' operational reasoning ability. As a consequence of these researches, several writers have emphasized the need to modify objectives, content, and teaching methods according to the level of cognitive development of learners. Some writers have also urged that the development of formal-operational reasoning should be a major priority in science education.

Cognitive development is thought to be a guiding factor for science achievement and attainment of science concepts. Some studies revealed insignificant relationship between formal-operational reasoning and science achievement and found students of differing cognitive levels to achieve similarly. Inconsistency in the findings related to operational reasoning ability and science achievement, and the effect of cognitive development level on science achievement creates the need for further investigation in this domain.

Relationship between operational reasoning ability and concept attainment did not cover the whole problem area. In addition to significant relationship, if obtained, between operational reasoning ability and concept attainment in physics, a question arose whether the relationship was due to the confounding effect of other variables or not? Although cognitive development was supposed to be an important factor for concept attainment, studies suggested that other variables also affect achievement and understanding of science concepts, viz. teaching methods, achievement motive, previous knowledge, general intelligence, etc. It seemed reasonable to see the relationship between operational reasoning and concept

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attainment in physics and the effect of stages of cognitive development on concept attainment in physics after partialling out the effect of some variables. Additionally, a question before the investigator was to see whether the combined effect of logical thinking/operational reasoning ability, general intelligence and achievement motive could provide higher correlations with performance on concept attainment tests in physics than either measure alone along with the relative importance of these measures for concept attainment in physics.

Based on the above premises, the present study was aimed at the following objectives:

#### MAJOR OBJECTIVES

1. To study the distribution of Piagetian development stages among Grade XI science students.
2. To study the relationship of operational reasoning and logical thinking with concept attainment of Grade XI students in physics.
3. To compare the concept attainment in physics of Grade XI students at concrete and formal operational stages of cognitive development.
4. To study the combined and relative contribution of logical thinking, general intelligence and achievement motive towards concept attainment of Grade XI students in physics.
5. To study the combined and relative contribution of different aspects of operational reasoning, general intelligence and achievement motive towards concept attainment of Grade XI students in physics.
6. To find out the interaction effect of achievement motive and stages of cognitive development on concept attainment of Grade XI students in physics.

#### SUBSIDIARY OBJECTIVES

1. To adapt Longeot's paper-pencil test of logical thinking in Hindi for the population of high school and higher secondary science students of Varanasi city.
2. To study differences in operational reasoning and logical thinking of Grade XI male and female science students.

#### METHODOLOGY

The present investigation, an ex-post-facto research, was conducted on the population of higher secondary science students of Varanasi city. To draw out the

sample, the incidental and purposive sampling technique was employed. The sample consisted of 240 (147 boys and 93 girls) Grade XI science students selected from four intermediate colleges of Varanasi city. These 240 students were those who were present during all the activities, viz. administration of tests and teaching. Four concepts of physics, viz. Force, Couple, Total Internal Reflection and Atom were taught, following the same teaching format by the investigator to provide control for the teaching method and the teacher's effect.

Logical thinking and different aspects of operational reasoning were measured by *Tarkik Chintan Parikshan* (TCP), Hindi adaptation of Longeot's test of cognitive development. General intelligence and achievement motive were measured by employing Joshi's Group Test of General Mental Ability and Achievement Motive Inventory of Gandhi and Srivastava, respectively. For measuring concept attainment in physics, concept attainment tests were used.

Partial correlations were computed to find out the relationship between operational reasoning and concept attainment in physics with the effect of general intelligence and achievement motive partialled out. One-way analysis of covariance was used to find out the effect of stages of cognitive development on concept attainment in physics with the effect of previous knowledge in physics, general intelligence and achievement motive held constant. Step-wise multiple regression was carried out to find out the joint and relative contribution of different variables towards concept attainment in physics. Analysis of covariance with  $3 \times 2$  design was employed for measuring interaction of achievement motive and stages of cognitive development on concept attainment in physics by using the method of unweighted mean for unequal observations per cell. In the allied studies, 't' test and percentages were worked out to find out the sex difference in operational reasoning and logical thinking, and distribution of cognitive levels.

## FINDINGS

The findings of the study are:

1. Majority of Grade XI science students (71%) are functioning at the concrete-operational level. Only 29% students show formal-operational thinking.
2. (a) Various aspects of operational reasoning, viz. class inclusion, propositional reasoning, proportional reasoning, combinatorial reasoning, and their total (logical thinking) are highly related ( $r = 0.430$  to  $0.799$ ) with the total concept attainment in physics of Grade XI students. Significant correlations, after holding constant the effects of general intelligence and achievement motive, ( $r = 0.229$  to  $0.621$ ) show that

logical thinking and different aspects of operational reasoning strongly influence concept attainment in physics.

- (b) Second-order partial correlation co-efficients of concept attainment in the concepts Force, Couple, Total Internal Reflection and Atom with logical thinking, propositional reasoning, proportional reasoning and combinatorial reasoning were found to be positive and significant ( $r = 0.149$  to  $0.513$ ). Except concept attainment in the concept Couple, class inclusion revealed significant correlation with concept attainment in Force, Total Internal Reflection and Atom. Consistently high correlations of proportional reasoning and combinatorial reasoning, in particular, and logical thinking, in general, with all the physics concepts, selected for this study, suggest that they were very important for better performance in physics.
3. Formal-operational Grade XI science students outperform their concrete-operational counterparts on total concept attainment in physics as well as on concept attainment in individual concepts, viz. Force, Couple, Total Internal Reflection and Atom even after both groups had been made equal with respect to previous knowledge in physics, general intelligence and achievement motive. Formal-operational students seemed to possess greater capacity to attain concepts than concrete-operational students.
4. (a) Multiple correlation of total concept attainment in physics with logical thinking, general intelligence and achievement motive was found to be 0.836. This means that 69.89% of the variance in total concept attainment in physics has been covered by these three predictor variables. Logical thinking (63.84%), general intelligence (5.05%) and achievement motive (1.00%), all make significant contributions towards the prediction of total concept attainment in physics.
- (b) The results obtained by the process of multiple regression analysis of concept attainment in each concept on logical thinking, general intelligence and achievement motive indicated that attainment in the concepts Force, Couple and Atom were predicted significantly by all three variables. For the concept Total Internal Reflection, logical thinking and general intelligence were the best predictors. The total variance explained by the combination of best predictors was 51.84%, 50.55%, 51.41% and 57.76% for concepts Force, Couple, Total Internal Reflection and Atom, respectively. Among these variables, logical thinking emerged as the strongest predictor of concept attainment in all the concepts.
5. (a) Multiple correlation of total concept attainment in physics with general intelligence, achievement motive and various aspects of operational

bookish knowledge while the socializing process which is a must for the child is eventually left out.

Unfortunately, in our country, the advantages of residential schools are taken, by and large, only by those students who belong to urban and rich families. It is perhaps due to the fact that education in these schools is too costly and most of the schools are located in urban areas. Thus, children from rural areas are not benefited from these schools on account of distance problem, on the one hand, and their poor socio-economic status, on the other.

In order to provide these students good education, on the one hand, and significant advantages of residential education, on the other, the Government of Uttar Pradesh introduced the residential education programme in 26 selected Government Intermediate Colleges of the state. The objectives of the programme are:

- to develop self-confidence in the students by removing inferiority complex in them;
- to encourage them for self-learning;
- to develop creative thinking ability in the students;
- to develop well-adjusted personality of the students.

## OBJECTIVES OF THE STUDY

### *Main Objectives*

1. To investigate the effectiveness of the residential education programme in terms of:
  - (a) Development of well-adjusted personality in the areas, namely, social adjustment, emotional adjustment, home adjustment, school adjustment and health adjustment.
  - (b) Development of self-confidence in the students.
  - (c) Development of creative thinking ability in the students.
2. To identify the major difficulties faced by tutors in conducting the residential education programme.
3. To investigate how many facilities recommended by Government are really availed of by the students.
4. To formulate some concrete suggestions for better implementation of the residential education programme.

## METHODOLOGY

The study employed the ex-post-facto experiment. The design utilized was the equivalent group design matched on pairs. The students of the experimental and

control groups were matched, pair by pair, on the factors namely, intelligence, socio-economic status and rural/urban cultural background. The study was conducted in two phases. In the first phase, data-gathering instruments were prepared which involved the development and standardization of students' self-confidence inventory, residential education programme inventory for students and tutors. The other instruments such as *vyaktiva parakh prashnawaly* developed by M.S.L. Saxena, verbal test of creative thinking developed by Baqer Mehdi, intelligence test developed by P.N. Mehrotra and socio-economic status (rural) developed by S.P. Kulshrestha were passed through the process of establishing their reliability and validity on the population under study, through appropriate methods. The second phase included (1) collection of the data, (2) scoring of the answer scripts, and (3) analysis and interpretation of the data.

#### POPULATION AND SAMPLE

The population of the study consisted of all class students and tutors associated with the residential education programme in Government Intermediate Colleges located at Varanasi, Meerut, Agra, Allahabad, Jhansi, Bareilly, Gorakhpur, Lucknow and Faizabad plain regions of Uttar Pradesh. Three hundred and eighty-eight students (194 with and 194 without the residential education programme) and 42 tutors of Government Intermediate Colleges located at Jhansi, Orai, Agra, Mathura, Etah, Pilibit and Moradabad constituted the total sample of the study.

#### FINDINGS AND CONCLUSIONS

1. The residential education programme was not significantly effective in developing the level of social adjustment among the students.
2. The programme was significantly effective so far as the development of emotional adjustment of the students was concerned.
3. It was significantly effective in developing the level of school adjustment of the students.
4. It was significantly effective but in negative direction so far as the development of health adjustment of the students was concerned.
5. The programme was significantly effective in developing the level of home adjustment of the students.
6. It was significantly effective in developing the level of total personality adjustment of the students.
7. It was significantly effective so far as the development of self-confidence of the students was concerned.

8. The programme was significantly effective so far as the development of verbal fluency ability was concerned.
9. The programme was significantly effective in developing verbal flexibility ability in the students.
10. The programme was significantly effective in the development of verbal originality ability in the students.
11. It was significantly effective in developing the verbal composite creative thinking ability of the students.
12. Although the students had scholarship facilities available to them, they had to face a lot economic problems because of the payment of the scholarships.
13. Lack of co-operation from other staff of the college, such as principal and teachers caused some problems to the tutors resulting in the improper functioning of the residential education programme.
14. The amount of budget made available for the conduct of the residential education programme was not enough to make the programme effective.
15. The tutors under the residential education programme were so much overburdened with a variety of responsibilities then they were not in a position to operate the residential education programme properly.

#### EDUCATIONAL IMPLICATIONS

As the residential education programme was found to be significantly effective so far as the development of level of personality adjustment, self-confidence and creative thinking ability were concerned, the investigator feels that this programme be introduced more widely not only in Uttar Pradesh but also in other states of the country.

The next alarming finding of the investigation is that the residential education programme was not significantly effective in developing the level of social adjustment of the students. In fact, under the process of development of level of personality adjustment of the students, the social adjustment aspect cannot be treated in isolation as it is an important and forceful determinant of human personality. Therefore, it is the responsibility of the college principals and tutors that they may organise such types of programmes and activities which may help the students in the development of their level of social adjustment.

As the tutors were overburdened due to several other responsibilities of the college and they faced the problem of non-co-operation from principals and other teaching staff in conducting the REP properly, it is suggested that the practice of linking the residential education programme with Government Intermediate Colleges, as today, should be dropped and separate independent residential schools may be opened.



In order to remove inefficiency in the administration of the programme, a full-fledged organisation or a separate cell under the Department of Education, Uttar Pradesh, may be set up, the prime function of which should be to look after the implementation of the programme properly. The selection of students and tutors should also be governed by this body, not by the principals. To provide academic guidelines to this organization/cell, a committee comprising of eminent educationists, social scientists and specialists in the field of residential education should be constituted.

As the students had to face a lot of economic problems due to an inadequate amount of scholarship paid to them, the budget allocation and the scholarship amount should be increased.

The scholars selected under the programme come from poor rural families. After two years of joining the programme, these students develop their level of personality adjustment, self-confidence and creative thinking ability, but they do not continue their higher education due to a number of economic problems. Keeping this in mind, the scope of the programme may be extended up to the University level.



*Women's Education in Various Education Commission Reports and Documents since Independence: Recommendations*

MUJIBUL HASAN SIDDIQUI

THIS study was undertaken with the following facts in view:

1. The Indian society consists of Hindus, Muslims, Christians, Parsis, Sikhs and Jews, each having different religion, traditions and customs.
2. Our society has different cultural groups and sub-groups, some of which have developed a tendency of exclusiveness and hostility towards others. This state of affairs makes emotional integration and national unity extremely difficult.

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Degree awarded by Aligarh Muslim University (1986)

3. Family and marriage laws are the two basic concepts that determine the status of women in a society.
4. The study of any problem requires a critical and analytical examination of its fundamental elements.
5. The status assigned to women in the Hindu, Muslim, Christian, Sikh, Parsi and Jewish communities is not the same. Among the Hindus there are great differences and divergences in the status of women (on the basis of region, caste and tribal zones.)
6. One of the main barriers to the development of integrated programmes of education, health and nutrition is the low level of literacy among women.
7. About 70 per cent of the population of our country is living in rural areas. This dimension has its own problems.
8. Ours is a secular democracy and our Constitution provides different provisions under different Articles:
  - (a) Equality of opportunity (Article 16).
  - (b) Freedom of speech and expression, assembly, association or union (Article 19).
  - (c) The State shall endeavour to provide within a period of ten-years from the commencement of this Constitution, for free and compulsory education for all children until the age of 14 years (Article 45).

#### ASSUMPTIONS

The investigator made the following assumptions before formulating the problem:

1. Men and women have marked physiological and psychological differences as individuals even though they have a great deal in common. However, as biological beings, their physical needs and mental processes are almost identical.
2. The different roles of men and women in society are complementary and equally valuable.
3. Education should take account both of individual differences between the sexes and their social functions.
4. The problem does not so much concern a small minority of women who somehow get to a university or some other institution of higher education as it concerns the vast majority of women in India.

#### METHOD OF STUDY

A critical interpretation and evaluative study of the available material on the subject of the study was made.

### SOURCES OF DATA

The following sources were used to collect the data:

1. Original reports and documents of various Commissions.
2. Selected critical literature available on women's education in books, journals, newspapers, magazines, annual reports of education, etc.

### DELIMITATIONS

The present study had the following limitations:

1. Women's education is too vast and complex a field and its study, in all its aspects, is too ambitious a task to fall within the scope of an M.Ed. level dissertation.
2. The present investigation, therefore, did not attempt to study women's education in all its shades and aspects, but selected only a small area of women's education in the various education reports and documents since Independence. Hence, a discussion of all the themes and concepts of women's education is not to be expected in this dissertation.
3. As this study is mainly based on the various commission reports and documents, the author also consulted secondary sources (books and journals) where original documents were not available in libraries.

### CONCLUSIONS

The present study led to the following broad conclusions.

After independence the educational resolve of Indian people found expression in the Constitution of India. Several provisions have been made in it for education to uplift the status of men and women in our country. Article 45 of the Constitution states very clearly that the state shall endeavour to provide, within a period of ten years from the commencement of the Constitution, for free and compulsory education for all children until they complete the age of fourteen years.

In Article 39 (a) also it is emphasised that the state shall, in particular, direct its policy towards securing that the citizens, men and women, equally have the right to an adequate means of livelihood.

The report of the University Education Commission (1948-49) emphasised in relation to the importance of women that "there cannot be an educated people without educated women. If general education had to be limited to men or to women, then it would most surely be passed on to the next generation".

The University Education Commission recommended co-education at the degree level and all the subsequent commissions and committees have made the recommendation regarding co-education keeping in view the financial and psychological advantages involved.<sup>4</sup>

The report of the Secondary Education Commission (1952-53) has also several recommendations for education of women, though without dealing with the problem of women education as separate from the problems of men education. It points out that "there is no special justification to deal with women's education because every type of education open to men should also be open to women". Many women have joined the faculties of engineering, agriculture, veterinary, science, commerce, law and teaching as well as arts and science and have taken to research.

As far as co-education is concerned, the report of the Secondary Education Commission remarks that "so far as the primary and the university stage are concerned, co-education was generally favoured, but in regard to education at the secondary stage, there was considerable divergence of opinion". In this relation the Secondary Education Commission recommended that "efforts should be made by state governments to open separate schools for girls wherever there is demand for them".

The National Committee on Women's Education (1958-59) and its two subordinate committees—Hansa Mehta Committee on Differentiation of Curricula for boys and girls (1961-62) and Bhaktavatsalam Committee (1963) dealt with the matter of women's education comprehensively. The report of the National Committee on Women's Education made useful recommendations regarding curriculum for boys and girls at the primary stage and at the secondary stage there is need for differentiation for curriculum for boys and girls. It also emphasised professional and vocational education.

The Kothari Education Commission (1964-65) endorsed the recommendations of the preceding committees. In its Report, the Commission further recommended that "the education of women should be regarded as a major programme in education for some years to come and a bold and determined effort should be made to face the difficulties involved and to close the existing gap between the education of men and women in as short time as possible".

The National Policy on Education Statement (1968) laid emphasis on women's rights. It stressed the need of technical and vocational education for women for ensuring better employment prospects for them.

The National Policy on Education Statement (1979) emphasised that highest priority must be given to free education for all up to the age of 14 as laid down in the Directive Principles of the Constitution. It also emphasised giving of incentives, such as mid-day meals, free textbooks, stationary and uniform for children of scheduled tribes, especially in rural areas.

The National Policy on Education Statement (1986) has chalked out a special programme for women's education under its Part IV. It has laid emphasis on the removal of disparities in the field of women's education.

The Government of India has also given priority to the education and upliftment of women in its Seventh Five-year Plan (1985-90). In the renewed 20-point programme of the Government, the problem of education and upliftment of women has been given a new impetus and urgency.

Thus we see that the Republic of India has been awake to the problems of women and their education since Independence. Its will and resolve to remove discrimination and disparities in the case of women and their education has been finding forceful expressions in the reports of various Commissions and Committees appointed by the Government since Independence. Much has been achieved during these decades. But much more still remains to be achieved.

If we have really to fulfill our Constitutional promise of providing free, universal and compulsory education to all children up to the age of 14 years, then funds should be released on an ever-increasing rate for education. More and more emphasis should be put on adult/continuing and extension education. Distant education, through non-formal agencies, should not only run parallel to formal education, but should also supplement it continually. Laws should be enacted to force parents to send their children to school when they are in their school-going age. All kinds of incentives should be given to students to lure them to school and to make them remain there till the completion of their higher secondary education, so that the drop-out rate may be brought to the minimum. And while doing all this the interests of girls and women as the second better half of the Indian people should be kept uppermost in the mind, so that the effects of injustices and discriminations heaped on them over the centuries may be removed as fast as possible and they may come up to occupy their due place in our national life as equal and honoured citizens.



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## Research Notes

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### *Education and Scientific Research in Japan*

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THE Ministry of Education controls and supervises education in Japan by issuing the needed syllabi. All school textbooks are supplied by this Ministry irrespective of whether the schools are private or sponsored by the educational authority. A number of alternative books too are available on each subject; the teacher or the school can select any one of them for the students. Thus, throughout the country, the students leaving high schools have almost similar learning maturity.

The country is divided into 47 prefectures and each prefecture has its own board of education. Cities have their own boards of education to sponsor primary and junior high schools. In Japan, there are also a number of Christian schools, which are, of course, private institutions.

Formal education in Japan starts at the age of six, though two-year kindergarten is available. However, the two years spent in such schools do not make any difference because every child at the age of six can join a primary school, even though he/she might not have studied in kindergarten. There are no entrance requirements in schools either sponsored or by local or district authorities. Education is compulsory for nine years and it comprises six years in the primary school and three years in the middle or junior high school. Education in high school lasts

three years. Though high school education is not compulsory, still 80 to 90 per cent of the students passing out of junior high schools join high schools. There is some training in natural sciences even at the primary level, though it is limited to observing of things and objects around, including some everyday phenomena.

### JUNIOR HIGH SCHOOL

At the age of twelve when the child enters the junior high school, he or she encounters, for the first time, the scientific method of thinking and learns the why and the how of many natural phenomena. The students spend equal time on various subjects and languages. For example, they study Japanese, social sciences (history-geography), science, mathematics and foreign language each for six hours in a week. The foreign language most commonly studied is English, though students can study Chinese, German, French, etc. However, the main emphasis in the teaching of a foreign language is on reading and writing whereas the conversation part is usually neglected. This is the reason for a Japanese to be usually weak in conversation in a foreign language though he/she may be able to understand printed matter in a foreign language and may even write well in it.

Sciences are grouped into two distinctive fields: (1) physical sciences comprising physics and chemistry, and (2) biological sciences including earth sciences.

### HIGH SCHOOL

Students in a high school class are normally 40-50 and the teacher-pupil ratio is 1:20. The contact period in a high school is uniformly of 33 hours all over the country with a load of 15 hours per week for the teacher. Teachers have to spend one hour extra for club activities in the school or one hour for class tutorial work per week.

The schools have excellent gymnasiums with a number of physical instructors and these are the places for a lot of indoor games.

Most of the high schools are co-educational. The high schools are also of two types.

1. General schools provide for all-round education, and science is taught in all the three years.
2. Special schools are meant to teach special courses, for example, commercial agricultural or other technical courses. Such schools serve the purpose of vocational schools.

In Japan, one science subject is taught for one whole year. General biology and geology are taught for three hours each in the first year. Chemistry is taught for six

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hours in the second year, whereas physics is taught for three or six hours in the third year. The students studying physics only for three hours per week in the last year have to devote three hours extra either to languages or to social sciences. However, the latter arrangement is not being favoured and most of the students devote six hours to physics in the last year.

### SCIENCE TEACHING

There are excellent separate laboratories for teaching chemistry, physics, biology and geology. The laboratories are equipped well and have good preparation and chemical balance rooms attached to them. In these courses, the inductive nature of chemistry as a branch of natural science is fully emphasised. The courses are principle-based but the examples of essential facts which are needed to explain the principles are ample. The students have good knowledge of mathematics and use it to solve chemical problems. Any subject or material which is not to be used in later courses in any way is not offered even at school level.

### TRAINING AND RETRAINING OF TEACHERS

Teachers of science are science graduates from universities which offer a four-year course. Science graduates from ordinary universities, after a short training of 15 days under the supervision of a teacher, can also be employed as teachers. However, only graduates from universities of education can be employed as teachers in primary and junior schools.

Recently, the school curriculum all over Japan has been upgraded and updated. For a proper implementation of the programme, retraining of teachers was felt necessary. To meet this demand, educational research and in-service training institutions, one in each prefecture financed jointly by the Ministry of Education and the board of education of a prefecture, have been set up.

### MIYAGI PREFECTURAL INSTITUTE FOR EDUCATION

The functions of this institute are:

1. Imparting of in-service training to primary school, junior high school and high school teachers.
2. Investigation and research on the school and social aspects of education.
3. Counselling about education in general and giving vocational guidance.
4. Collection and utilization of data on education and the publication of the results of research.



5. Annual publication of the research bulletin.

#### UNIVERSITY EDUCATION

Admission to a university or to an undergraduate college is on the basis of a test irrespective of the performance of the student in the high school. However, this test may or may not be in every subject. The undergraduate course is of four years. In the undergraduate course in the science faculty, the students may study the following courses:

1. Two languages from among English, German, French, Chinese, etc.
2. Four sciences from among Mathematics, Physics, Chemistry, Biology and Geology.
3. One arts subject from Political Study, Economics, Sociology, Psychology, etc.
4. Gymnasium.

Specialization, however, starts at the graduate level only. This is a five-year course of which the first two years are called the Master's course and the remaining three years the Ph.D. course. The Ph.D. programme may be with or without course work. Thus, taking an overall view, one can say that the M.Sc. course requires 18 years and the Ph.D. course, 21 years of education. The usual age of a person getting the Ph.D. degree is 27 years in Japan, compared with about 22 or 23 years in India. Of course, the students while they are working for the Master's or Doctor's degree get government scholarships which help them to maintain themselves. Before the World War II, Japan had eight universities established by the government and used to be called Imperial universities. The number now is quite large. There are also a large number of private universities. However, the old universities are still the leading universities in the country. The research facilities in the universities are excellent and are supported by maintenance grants from the government; special grants are also made available to individual professors for research after their project has been examined thoroughly by government agency. For all research institutes which are usually attached to the universities, the Research Council recommends grants for them.

#### SPECIAL RESEARCH INSTITUTES

Apart from the main departments, there are number of special research institutes which belong to the university but have a separate staff. The members of the staff in an institute have the same position as other members of the staff who are attached

to the main teaching departments or the faculties. The following research institutes belong to the Tohoku university:

1. National Institute for Education Research.
2. Research Institute for Iron, Steel and other Metals
3. Institute for Agricultural Research
4. Research Institute for Minerals, Dressing and Metallurgy
5. Research Institute for Tuberculosis and Leprosy
6. Research Institute for Scientific Measurements
7. Research Institute for High-speed Mechanics
8. Research Institute of Electrical Communication Solutions
9. Chemical Research Institute of Non-aqueous Solutions

### OTHER SCIENTIFIC ORGANISATIONS

#### *1. Japan Academy or Japan National Academy*

Before the World War II, this Academy used to be a powerful scientific body in Japan. But now most of its consultative and academic functions have been taken over by the Science Council of Japan. However, its membership is still a big honour. There are 175 members, out of whom 95 belong to natural sciences and 80 to the humanities and social sciences.

#### *2. The Science Council of Japan*

This body was created only after the World War II by an Act of Parliament and is directly attached to the Prime Minister Secretariat. This is the consultative agency of the government for all matters concerning science and technology. This is a unique body in the sense that it is not a part of the machinery of the government. It functions independently of the administration. It is primarily a deliberative body. It organises international conferences and sends Japanese scientists to international bodies abroad. It recommends the names of scientists for international meetings abroad. It also recommends the names of scientists who form the committee which helps the Ministry of Education to distribute grants-in-aid to all individual scientific workers on the basis of the projects submitted for grants to the Ministry. It also draws long-term Research plans for the country.

The Science Council of Japan also approves the creation of all special research institutes which are not affiliated to any single university but are available for use by all the universities of the country.

### 3. *The Ministry of Education*

The Ministry of Education has its own committees. The research committee, for example, considers applications for research grants for all professors directly and supports those applications which are thought to be fit for support.

The Education Ministry also helps by sending researchers out of Japan for varying periods; junior people for three months; senior people for short periods; and outstanding people for attending seminars, symposia, conferences, etc.

### 4. *The Japan Chemical Society*

The Japan Chemical Society is designed to be the counterpart of the British Council for the promotion of Science. It is a very powerful body and has a membership of about 3500. The Indian Chemical Society has a membership not exceeding 1500. The difference becomes more pronounced when we realize that the population of India is almost five times that of Japan. The Japan Chemical society has, thus, ample funds drawn mainly from its membership fees and is very successfully publishing six journals regularly. In addition, it also publishes notes, abstracts of papers, etc.

The Japan Chemical Society, apart from its interest in research in different fields of Chemistry which it promotes by holding meetings, seminars, symposia, etc. is also very much interested in chemical education at all levels. The recent changes in chemical education at all levels have been on the initiative of the Japan Chemical Society which has appointed a committee for this reform.

### 5. *Japan Society for the Promotion of Science*

This society was founded in 1967. It is supervised by the Ministry of Education, Science and Culture. It provides 300 fellowships annually to foreign scientists for cooperative study in Japan. It conducts bilateral programmes with 40 foreign organisations, thus exchanging 1200 scientists annually. It administers several domestic programmes including those for post-doctoral fellowships.

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### *Academic Achievement of Pre-engineering Students in Relation to their Socio-economic Status*

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IN one's life, academic success is highly valued as all intellectual capabilities of an individual are assessed by his scholastic achievement. The present study is an attempt to find out the difference in academic achievement at different levels of socio-economic status of pre-engineering students.

This research work may prove a corner-stone in knowing the difference of scholastic achievement with various levels of socio-economic status of pre-engineering students. It will ensure the conception whether academic achievement changes on various socio-economic status levels or not. Sometimes it is considered that students coming from healthy socio-economic background tend to score higher in their academic achievements.

Rossi (1953), Rao (1956), Weshburne (1959), Wiseman (1967), Saini (1968), Lincoln (1969) and Srivastava (1980) found positive relation of socio-economic status to academic achievement, whereas Thorndike (1952), Cattell et al. (1966), Meller (1970), Ahluwalia and Deo (1978), Venkataiah (1980) found negative or very low correlation between academic achievement and socio-economic status.

The main objective of this study was to find out whether there is any difference in academic achievement at different levels of socio-economic status of pre-engineering students. It was hypothesized that there exists a significant difference in

academic achievement at different levels of socio-economic status of pre-engineering students.

### SAMPLE

A limited sample consisting of 120 students of pre-engineering class from four colleges of Ambala, i.e. D.A.V. College, Ambala City; S.A. Jain College, Ambala City; S.D. College, Ambala Cantt. and G.M.N. College, Ambala Cantt. was picked up incidentally.

### TOOLS

1. The marks obtained by the subjects in their final pre-university/higher secondary examination were taken as academic achievement.

2. B. Kuppaswamy's Socio-economic Status Scale (Urban) Form B for measuring socio-economic status was used. In this scale, there are three categories—education, occupation and income of father/guardian on the basis of which socio-economic status is determined. Socio-economic status is divided into three levels in general (with limits of  $M \pm 1$ ).

### ANALYSIS

1. The raw scores of achievement and socio-economic status were first converted into t-scores. Descriptive statistics like mean, median, mode, standard deviation, skewness, kurtosis and chi-square were worked out to study the nature of distribution of scores of socio-economic status and achievement.

2. Pearson's product moment correlation was used to find out the correlation of socio-economic status with achievement.

3. 't' test was used to find out the significance of the differences of means and other statistics calculated.

### RESULTS AND DISCUSSION

#### *1. Nature of Distribution of Scores*

The nature of distribution of scores is presented in Tables 1 and 2. The main criterion adopted to test the phenomenon of normal distribution was the test of goodness of fit which showed normal distribution in case of socio-economic status and the distribution for academic achievement deviates from the normal.

TABLE 1 Results of the Test of Goodness of Fit Applied to Verify the Phenomenon of Normal Distribution Operating in the Measure of Achievement			
Class Interval (CI)	Observed Frequency (OF)	Expected Frequency (EF)	Smoothed Frequency
78-80	0	.1	.33
75-77	1	.2	1.00
72-74	2	.4	2.00
69-71	3	1.0	2.33
66-68	2	2.2	2.67
63-65	3	4.2	2.67
60-62	3	7.2	3.33
57-59	4	10.8	7.33
54-56	15	14.4	11.67
51-53	16	16.8	17.00
48-50	20	17.2	18.00
45-47	18	15.5	17.33
42-44	14	12.3	15.67
38-41	15	8.5	11.00
36-38	4	5.2	6.33
33-35	0	2.8	1.33
Total	120	118.8	119.99
Chi square $\chi^2 = 20.59$ (Significant at .05 level)			
Mean = 49.9      SD = 8.33      df = 9			
Median = 48.85      Sp = .376      p - .01 = 21.666			
Mode = 46.75      Ku = 24      p - .05 = 16.919			

TABLE 2 Results of the Test of Goodness of Fit Applied to Verify the Phenomenon of Normal Distribution Operating in the Measure of Socio-economic Status			
Class Interval (CI)	Observed Frequency (OF)	Expected Frequency (EF)	Smoothed Frequency
70-74	0	2.0	2.33
65-69	7	5.9	8.00
60-64	17	12.7	16.33
55-59	25	20.9	20.33
50-54	19	25.7	21.33
45-49	20	23.5	19.33
40-44	19	16.1	15.00
35-39	6	8.3	10.67
30-34	7	3.2	4.33
25-29	0	0.9	2.33
Total	120	119.2	119.98
Chi square $\chi^2 = 9.95$ (Insignificant)			
Mean = 51      SD = 9.28      df = 6			
Median = 51.6      Skewness = .19      p - .01 = 16.812			
Mode = 52.8      Ku = .29      p - .05 = 12.592			

## 2. Significance of Differences Between Means

There is no significant difference in the achievement of the subjects at different levels of socio-economic status (high, average and below), as shown in Tables 3, 4 and 5.

TABLE 3 Mean and SD in Achievement of Subjects of Low SES and High SES		
	Mean	SD
Low SES	50.33	8.69
High SES	52.38	8.53
SD = 2.87 $t = .71$ (Insignificant) $df = 41$ SES = Socio-economic Status		

TABLE 4 Mean and SD in Achievement of Subjects of Average SES and High SES		
	Mean	SD
Average SES	49.56	8.03
High SES	52.38	8.53
SD = 2.63 $t = 1.02$ (Insignificant) $df = 88$		

TABLE 5 Mean and SD in Achievement of Subjects of Average SES and Low SES		
	Mean	SD
Average SES	49.56	8.03
Low SES	50.33	8.69
SD = 1.85 $t = .645$ (Insignificant) $df = 105$		

TABLE 6 Contingency Coefficient of Correlation between Academic Achievement and SES			
	Achievement		Total
	Below Median	Above Median	
Above Median	19	27	46
Below Median	37	37	74
$\chi^2 = .557$ ; $C = .068$ (Insignificant)			

TABLE 7 Value of Product Moment Coefficient of Correlation between Academic Achievement and SES	
Correlation	Value
Academic Achievement and SES	.092 (Insignificant)

### 3. Significance on the Basis of Simple Correlation

Product moment coefficient of correlation between academic achievement and socio-economic status is also insignificant at both levels.

The results show that there is no significant relationship between academic achievement and socio-economic status. This result is supported by the study of Ahluwalia and Deo (1978). It may be possible that some students with high socio-economic status may have low achievement but when we combine, the results are neutralised.

It might be a wrong notion that students belonging to high socio-economic status are good achievers and vice-versa. In addition to other factors, necessity may compel one to work hard and do better while lack of necessity (high socio-economic status) may be lethargic in relation to the efforts for higher achievement. And, since it is an adolescent age, it may be more natural on the part of the high socio-economic status group to be less careful in their studies as compared to the other group. So, this justifies the results obtained in the study.

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### *Chemistry Laboratory Safety Skills and Practices: Students' Self-evaluation in Selected Secondary Schools in Akwa Ibom State*

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**S**IGNIFICANT curriculum changes that have occurred in science education in recent years have pointed to the fact that science teaching in any secondary school is quite inadequate unless supplemented by laboratory activities. The reasons for experimental work are well known to all good science teachers. According to Virkus (1978):

"Science is a discipline and to be meaningful to the secondary science students, there must be activities complementing the cognitive knowledge required. Activities include everything from taking field trips, observing demonstrations, conducting laboratory investigations, to working independently on a science project. These activities, conducted safely, enhance the goals of science education that include attaining manipulative and communication skills, rational thinking process, and scientific attitudes. The science laboratory is where most of these activities will be conducted by the student".

A major consideration for anyone teaching a science subject in the secondary school should be safety. When teachers are aware of potential hazards and have given their students instructions and skills to avoid needless accidents, personal injury and equipment damage can be kept to a minimum.

Young (1983) has noted that secondary school chemistry laboratory practices often involve the handling of chemicals and equipment by students who are very unfamiliar with the nature of the hazards associated with the materials. In view of the fact that in most junior secondary science programmes the responsibility for safe laboratory practices is assumed solely by the teacher, it is unlikely that students

with incidental safety knowledge from these grades shall manage well with all aspects of sound laboratory procedures at the higher classes. Students need existing laboratory courses in chemistry to accommodate safety instruction as an integral part of all prescribed experiments. The fundamental concepts of safety associated with each laboratory experiment should be emphasized with the ultimate objective of reducing injuries and illness. With adequate planning and forethought, potential secondary school chemistry laboratory accidents can be prevented.

#### PURPOSE OF STUDY

The recent curriculum for Nigerian secondary school chemistry emphasizes chemistry as an experimental science with its roots in the laboratory; and requests that teachers should be guided by this philosophy in the teaching-learning process (Chemistry Curriculum for Senior Secondary Schools, 1985). This has obviously created a concern for safety awareness and responsibilities in the upper grades of any secondary school since students, with incidental safety knowledge from the junior secondary schools, shall not be able to manage well with most aspects of sound laboratory procedures at the higher grades.

This study was, therefore, concerned with the students' self-evaluation of their chemistry laboratory safety skills and practices in randomly selected senior secondary schools of Akwa Ibom State. The study revealed a good number of weak laboratory safety skills and practices among students; and pointed to the need for the alert and dedicated chemistry teacher to approach safety practices realistically, with proper precautions, to avoid needless accidents in the laboratory.

#### PROCEDURE

The questionnaire for this study asked students to self-evaluate their chemistry laboratory safety skills and practices during the teaching-learning process. The features of the American Chemical Society "*Safety in Academic Chemistry Laboratories*" (1979); and associated articles from the *Journal of Chemical Education* (Young, 1983; and Hanssmann, 1980) have been utilized as some basis for the development of the questionnaire. The construct validity of the questionnaire was determined by selected secondary school practising chemistry teachers from Uyo municipality schools.

The sample for this study consisted of 300 senior secondary two and three chemistry students from 30 randomly selected secondary schools in Akwa Ibom State. With the help of science teachers and principles, the questionnaires were administered to ten students at each of the participating schools and collected back

immediately after completion. This was done at different schools at different days. Out of 300 questionnaires administered, 200 were analysed. One hundred questionnaires, incorrectly completed, were discarded.

#### DATA ANALYSIS

The presentation and analysis of the data gathered in this study followed the organisational format of the questionnaire as indicated by the corresponding tables. The findings of the study were thus analysed under the following sub-headings:

1. General Laboratory Conduct (Table 1)
2. Experimental Technique (Table 2)
3. Emergency Facilities and Equipment (Table 3)
4. Safety Education (Table 4)

The scoring of items was done by assigning arbitrary weights of 3.0, 2.0 and 1.0 to a Likert-type scale response of "Always", "Occasionally", and "Never", respectively. A weighted mean response score for each of the questionnaire items was calculated on the one-to-three rating scale. The weighted item mean response scores between 2.60 and 3.00 were regarded as skills which were "Always" developed, practiced and/or carried out; the scores for any of the items that ranged between 1.60 and 2.50 were regarded as skills which were "Occasionally" performed; while the item scores between 1.00 and 1.50 were regarded as those skills which were "Never" developed or minimally practised.

The above item scoring and analyses helped the investigator to diagnose students' strengths and weaknesses in laboratory safety skills and practices during their routine "hands-on" activities in the science laboratory. The investigator was aware that assessments made in this way are, strictly speaking, subjective. They may vary as a result of inaccuracies and personal biases which are usually associated with subjective judgements.

#### *General Laboratory Conduct*

The data of Table 1 clearly revealed some serious weaknesses in the respondents' general laboratory conduct. These weaknesses are more pronounced by the skills descriptive of items 4, 5 and 8. The weighted mean scores to these items are good indicators to these facts. The negligence of most students to wear safety glasses during laboratory practice, as revealed by 70 per cent of the respondents, deserves special attention by all laboratory workers. Most students did not know where to get help fast in case of emergency. Moreover, laboratory assistants were generally lacking in the schools sampled; while most other skills were "Occasionally" practised.

**TABLE 1**  
**General Laboratory Conduct**

Skills Descriptive	Frequency of Response/ Percentage			Weighted Item Mean Score
	Always 3	Occasionally 2	Never 1	
During chemistry practice the students:				
1. Are provided with laboratory manuals and/or handouts	42 21%	56 28%	102 51%	1.70
2. Follow instructions explicitly	60 30%	80 40%	60 30%	2.00
3. Perform only authorized experiments	56 28%	86 43%	58 29%	1.99
4. Practise good house-keeping	40 20%	38 19%	122 61%	1.59
5. Wear eye protective equipment, e.g. approved safety glasses	20 10%	40 20%	140 70%	1.40
6. Avoid eating or drinking in the laboratory	80 40%	40 20%	80 40%	2.00
7. Learn basic first-aid procedures/equipment	52 26%	40 20%	108 54%	1.72
8. Know where to get help readily in the case of emergency	20 10%	40 20%	140 70%	1.40
9. Are provided with laboratory assistants	96 48%	60 30%	44 22%	2.24

**TABLE 2**  
**Experimental Technique**

Skills Descriptive	Frequency of Response/ Percentage			Weighted Item Mean Score
	Always 3	Occasionally 2	Never 1	
During chemistry practice the students:				
1. Read labels carefully	66 33%	80 40%	54 27%	2.06
2. Hold reagent bottles and beaker securely	52 26%	88 44%	60 30%	1.96
3. Keep noxious and toxic materials under hood	40 20%	62 31%	98 49%	1.71
4. Hold reagent bottles away from face	80 40%	80 40%	40 20%	2.20
5. Insert glass tubing in stopper carefully	24 12%	40 20%	136 68%	1.44
6. Are generally aware of working with glassware	42 21%	56 28%	102 51%	1.70
7. Wipe up spills, etc. from table after every experiment	70 35%	88 44%	42 21%	2.14

### *Experimental Technique*

The data of Table 2 revealed evidence of poor experimental techniques as indicated by the weighted mean scores to each of the items of the table ranging between 1.44 to 2.20. Most of the skill descriptives were "Occasionally" developed and/or practised.

### *Emergency Facilities and Equipment*

Table 3 showed item analysis with respect to students' knowledge of emergency facilities and equipment in the teaching-learning laboratory. The data revealed that the learners' knowledge of some identified emergency facilities and equipment were generally lacking. The weighted mean response score to each of the items on the table ranged between 1.37 to 1.75.

TABLE 3 Emergency Facilities and Equipment				
Skills Descriptive	Frequency of Response/ Percentage			Weighted Item Mean Score
	Always 3	Occasionally 2	Never 1	
During chemistry practice the students:				
1. Know the location of safety shower, fire blankets and eye wash, and how to operate them	24 12%	40 20%	136 68%	1.44
2. Are aware of the location of fire fighting equipment and how to operate them	20 10%	36 18%	144 72%	1.38
3. Have fully stocked first-aid cabinets in case of emergency	22 11%	30 15%	158 79%	1.37
4. Report at once all accidents and unusual occurrences	40 20%	70 35%	90 45%	1.75

### *Safety Education*

The data in Table 4 revealed some general weaknesses in safety education. These weaknesses were more pronounced in two areas: (1) the protection of eyes, body, face and hands with appropriate equipment was never practised by 74 per cent of the respondents; and (2) 70 per cent of those respondents were not made aware of the need to wear any aprons or gloves whenever they worked with chemicals. Most other skills descriptives of Table 4 were "Occasionally" practised

as could be seen from the weighted mean response score of each item ranging between 1.36 to 2.12.

Skills Descriptive	Frequency of Response/ Percentage			Weighted Item Mean Score
	Always 3	Occasionally 2	Never 1	
During chemistry practice the students:				
1. Are aware of the need to protect the eyes, body, face and hands with appropriate equipment	20 10%	32 16%	158 74%	1.36
2. Are aware of the effect of smoking in the laboratory	60 30%	84 42%	56 28%	2.02
3. Keep hands and face clean when handling chemicals	64 32%	56 28%	60 30%	2.02
4. Avoid direct skin or hand contact with chemicals	60 30%	70 35%	70 35%	1.95
5. Avoid tasting and/or smelling of chemicals unless specifically directed to do so	76 38%	70 35%	54 27%	2.12
6. Are aware of the need to wear apron and gloves whenever pouring chemicals	18 9%	42 21%	140 70%	1.39
7. Are advised to add a reagent slowly instead of 'dumping' it	22 11%	58 29%	120 60%	1.51
8. Avoid heating flammable liquids with an open flame	50 25%	50 25%	80 40%	1.85

A summary of the weak safety skills and practices diagnosed in the course of this study is presented in Table 5. The students' self-evaluation indicating their degree of chemistry laboratory safety skill development are categorized in the table as "Occasional Developed Skills" and "Never Developed Skills". The occasional developed skills would signify those items with weighted mean response score of between 1.60 and 2.50 which were "Occasionally" practised in the laboratory. Those skills that were almost never practised in the laboratory constitute the "Never Developed Skills" with the weighted mean response scores of between 1.00 and 1.50.

TABLE 5  
Summary of Weak Safety Skills and Practices

Occasional Developed Skills	Never Developed Skills
<i>General Laboratory Conduct</i>	<i>General Laboratory Conduct</i>
1. Provision of laboratory manuals and/or hand-outs to students	1. Practice of good house keeping
2. Following instruction explicitly	2. Wearing laboratory safety equipment, e.g. safety glasses, etc.
3. Performing only authorized experiments	3. Knowing where to get help readily in case of emergency
4. Eating or drinking in the laboratory	
5. Knowing first aid equipment/procedures	
<i>Experimental Technique</i>	<i>Experimental Technique</i>
6. Reading labels carefully	4. Inserting glass-tubing in a stopper carefully
7. Securely holding reagent bottles and beakers	<i>Emergency Facilities and Equipment</i>
8. Keeping noxious and toxic materials under hood	5. Knowing the location of safety shower, fire blankets and eye wash and how to operate them
9. Holding reagent bottles away from face	6. Awareness of the location of fire-fighting equipment and how to operate them
10. General awareness of working with glassware	7. Having fully stocked first-aid cabinets in case of emergency
11. Wiping up spills, etc. from the table after every experiment	
<i>Emergency Facilities and Equipment</i>	
12. Reporting at once all accidents and unusual occurrences	
<i>Safety Education</i>	<i>Safety Education</i>
13. Awareness of the effect of smoking in the laboratory	8. Awareness of the need to protect the eyes, body, face and hands with appropriate equipment
14. Keeping hands and face clean when handling chemicals	9. Awareness of the need to wear apron and gloves whenever pouring chemicals
15. Avoiding direct skin or hand contact with chemicals	10. Adding a reagent slowly instead of 'dumping' it
16. Avoiding tasting and/or smelling chemicals unless specifically directed	
17. Avoiding heating flammable liquids with an open flame	

## DISCUSSION AND RECOMMENDATIONS

1. The "Occasional Developed Skills" and the "Never Developed Skills" all point to ignorance in science laboratory safety. Correct attitudes towards laboratory

safety, skills and practices, which are likely to be carried on long past school years, are formed in student laboratory courses. A secondary school chemistry teacher has the unique responsibility of inculcating the correct laboratory safety attitudes in his students. The first course in chemistry should set the pattern for lifelong attitudes towards chemical safety in safety habits and safety consciousness in the immediate lab environment, and even in more advanced laboratories.

2. The weak safety skills and practices diagnosed in Table 5 clearly point to the fact that teachers should plan for safety. It is a fact that most secondary school teachers have had no formal training in science laboratory safety with exception of an occasional seminar and incidental knowledge from their student days' laboratory practice. One might rightly infer that majority of the secondary school teachers often are not aware of what constitutes a safety hazard. The poorly identified skills and practices, not often developed by students, and which result from the familiar symptoms of ignorance and/or administrative neglect included unawareness of the need to use laboratory safety glasses; and other ill-developed skills of working with glassware, operating fire extinguisher, using first-aid kits and eyewash, etc. The remedy to students' poorly developed skills would be to teach safety and provide for continuing education in this field for both practising teachers and students. The chemistry department should have a safety reference library that should be available to students and laboratory technicians at all times. The materials in the library should portray safety in the secondary school laboratory while simultaneously providing guidance for procedures to be used in the event of an accident.

3. Time before the first laboratory exercise should be used as an orientation period for students. The teacher should make sure that students understand all laboratory rules and regulations. He should point out features new to students in the laboratory layout which might include the use of fire blankets, and other emergency facilities and equipment. Visual aids, such as bulletin board posters and films on safety, if well chosen can impart a wealth of information with little consumer effort. With the preponderance of "Occasional Developed Skills" and "Never Developed Skills" in the course of this study, secondary school teachers need to know that they are responsible for the safety of the naive, curious adolescents in the laboratory and that they (teachers) may be held legally liable for negligence if a student brings a suit after a laboratory injury (Kurnath and Kurnath, 1981).

4. It may be necessary to establish a science laboratory safety club for all science students and laboratory personnel. Participation in such a club may be another way to involve the students and laboratory attendants and stimulate them to learn more about safety in academic laboratories. The motivation of a club member for safety practices may be greater than would ordinarily be because of the delegated responsibility that goes with membership. To be effective, the club must have duties



to perform. One important task should be the regular inspection tours of the science laboratories. A written report of any unsafe findings should be submitted to the administration with a recommendation for the correction of the problem. Among other delegated duties that the science teacher may assign the club may include:

1. Organizing safety meetings;
2. Peer tutoring in the proper use of safety equipment, working with glassware, chemicals and reagents;
3. Preparation of safety bulletins and posters; and
4. Constantly reminding students of their safety responsibilities in the chemistry laboratory.

## CONCLUSION

The answers to the problem of safety are the development of good disciplines and a correct attitude towards all practical situations. Teachers should be sensitive to the problems of their students which can become real hazards in certain laboratory situations. It is the responsibility of the chemistry teachers to see that provision for safe working and first-aid are made; and rules enforced. An attitude of alertness to dangers coupled with good common-sense practices should permeate the science classroom, and the chemistry laboratory in particular.

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## Book Reviews

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### Great Treasure

**A Book on Books**

C.C. Vishwanathan,

Prachi (Professional) Publishers, Lucknow, 1988, pp. 133, Rs 110.00

**B**OOKS make man's great treasure. They preserve and transmit knowledge and wisdom from generation to generation. There are thus books and books of all sorts catering to the needs and aspirations of the whole range of man's urge in quest of life's purpose, civilization and culture. Indeed, even before the invention of the printed word, the process of handing valuable scripts over to posterity has continued without an end and in various forms, both written as well as oral, in the form of hand-written manuscripts on palm leaves, stones, wood carvings, etc., as also in the form of oral traditions like folklores, folkways, mores, etc. With the advent of press and paper and an ever-evolving printing technology, the entire scenario of the world of books has undergone radical transformation over the years. Naturally, in order to catch up with the pace of knowledge explosion and book boom, it becomes important to help the reader select really worthwhile reading material apropos to his requirement. The book under review makes an attempt in this direction.

Divided into fourteen small chapters, the book deals with a host of issues pertaining to book production, book preservation and book utilization, with the principal focus on how libraries and information centres could boost the habit of

reading books amongst readers. Various topics dealt with, therefore, include items like importance of books for enrichment of learning and literature; culture and civilization; proper choice of requisite books vis-a-vis library reading; personality development and book culture; bibliography and bibliometry classification and the art of using books; book production and management; print versus electronic media; reading interests and reader categorisation; etc. However, insofar as the process of schooling is concerned, there could be three principal demands, namely, (i) locating library resources for enrichment of curricular needs and aspirations of students and teachers; (ii) hunting resource material for solving specific problems and research work in various aspects of education, in particular, and life, in general; and (iii) helping the lay reader as well as the specialist choose books for general or specialized reading to enrich their life style and areas of specialisation. These aspects are indirectly reiterated at different places in the book to highlight their over-riding importance in the context of library reading. Also, it is not the quantity of books in a library that matters; it is really the quality of books that enhances the value of a library. Helping the reader select quality books thus constitutes the strength of a good library service. While selecting a book for study, it is desirable to examine its prelims, that is, its title and subtitle, content in terms of chapter headings and sub-headings, author's credentials as per preface, foreword, and blurb, publisher's status, and to be more specific in relation to reader requirement, going through the index of the book is also of utmost consequence. So, too, the glossary of the terms used. A quick glance at the content coverage and its analysis would reveal to an extent the relevance of the book for more tangible reading. The book under review also refers to the systems of book classification for making library management efficient.

The central thesis of the book obviously focuses on one of the most important functions of the library to guide the reader how best to choose and use books to one's advantage, as also, in turn, how not to misuse or abuse them. In the author's words, "education of the users of books has been a necessity and the habit should be inculcated quite early from the stage of school library use" and, as such, "curriculum of the schools of library and information science would do well to include the subject 'user education' as a compulsory one for all students from the undergraduate level onwards". This kind of thinking has been gaining ground in the world of education for quite a while and there are now certain institutions, like NCERT in our own country and abroad that organise programmes in schools as well as in library science institutions with the specific purpose of orienting teachers, teacher librarians, as also professional librarians to cater to the book users' needs and expectations from the library service. It is in this context that this book makes a welcome addition to the corpus of knowledge in the perspective of information order and library science as a worthwhile consumer tool. Most of the remaining

issues raised in the bulk of the book only serve as background material in defence of the heritage of books.

It may nonetheless look very odd to point out that the book suffers from a host of obvious shortfalls. For instance, in this kind of a book or books, it would have been extremely useful to include a chapter on documentation and annotation to help the reader, particularly the research scholar and for that matter the school teacher develop relevant skills so useful in the task of making reading quite effective. Nor does it throw any light on the hazards of book production, its rules and regulations in legal and academic perspectives, and other requirements to be fulfilled. Besides, the status of a library is determined not simply by the quality or quantity of books it has on its shelves. It is much more dependent also on the number, nature and quality of journals, magazines and newspapers it subscribes, as also on how best these information and knowledge sources are tapped or exploited for educational purposes. Reference to aspects like these would naturally have enhanced the value of the book.

ANIL



## Income Inequality

### Sources of Income Inequality

Harbhajan Singh,

Patriot Publisher, New Delhi, 1990, pp. 260 + XVIII, Rs 170.00

**T**HE book under review deals with an important subject of income inequalities on which not much empirical research has been done in the country. The author has made an attempt to examine empirically the extent of inequality among full-time male adult employees. It examines the contribution of human capital variables, sociological variables and job-related variables to income differentials. After reviewing the rich literature on the subject, the author establishes empirically

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the significance of some of the important sources of inequality. This may induce the economists and sociologists to recast the neo-classical explanation of income inequality *de novo*. Various positive and normative measures of inequality have been computed and compared. Co-efficient of mean deviation, co-efficient of variation, Gini's co-efficient, Theil's entropy measures, and Atkinson's normative measures have been deployed and decomposed for various educational and occupational categories. Step-wise regression procedure with continuous and dummy regressors has been used to identify the significant variables contributing to inequalities. The author provides through standard statistical analyses evidence about the extent to which income inequality may be significantly attributed to human capital variables, sociological variables and job-related variables. An important contribution of the present work is that it demonstrates the crucial role of sociological variables in generating income inequality.

Two policy implications of the present work are: equitable educational system may be deployed as an instrument of reducing economic inequality, and equitable income policy may be enforced to generate the desired magnitude of economic equality.

The book provides comprehensive references at the end of each chapter, thereby enhancing the usefulness of the book to professional as well general readers. Being the first edition, there are some minor misprints which, it is hoped, will be corrected when a revised edition of the book is brought out.

R.K. MATHUR



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# Estimation of True Change under Matrix Sampling Models

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Most studies conducted in the area of measurement of change are based on the pretest-posttest design in which the total scores obtained on the two testings are used for estimating true change. In such a design, item variation has not been given due consideration. This paper deals with the problem of estimating an individual's true change and reliability of change scores by using different matrix sampling models. In such models, test items are selected from a universe of possible items and the test is applied to the examinees selected from a universe of examinees. Two-stage sampling, stratified random sampling and simple random sampling procedures have been considered for the construction of the test.

The regression of true change on observed change approach has been used for estimating the true change of an individual. A numerical example with hypothetical data has been considered for illustration purposes. It has been found that amongst the three sampling models considered here, the stratified sampling model provides the highest reliability of true change score followed by the simple random sampling and two-stage sampling models.

**A**LTHOUGH simple difference scores are most commonly used to measure individual change, several researchers have criticised them due to their low reliability, low validity and having negative correlation with initial status (e.g. Bereiter, 1963; Cronbach and Furby, 1970; Linn and Slinde, 1977; Lord, 1963). As a result of these limitations, some researchers have proposed alternative methods, such as regression estimates of true gain (Lord, 1956; McNemar, 1958), residualised difference scores (Manning and DuBois, 1962), base-free measure of change (Tucker, Damarin and Messick, 1966), use of multi-wave data (Gupta, Srivastava and Sharma, 1988, 1989; Rogosa, Brandt and Zimowski, 1982), etc., for estimating an individual's true change. But most of these studies are based on pretest-posttest design in which total scores obtained by each individual on the two testings are used for estimating true change. The source of variation due to sampling of items which constitute the test has not been given due consideration.

The problem of test reliability and estimation of true scores has been dealt with by a number of authors (e.g. Das, 1967; Gleser, Cronbach, and Rajaratnam, 1965; Lord, 1962; Srivastava and Sharma, 1977) using the matrix sampling model in which the test items are assumed to be drawn at random (or with some other sampling design) from a universe of items and the persons tested are, of course, considered as a random sample of persons from a given population. Both the samples are assumed to be drawn independently of each other.

Initially, the use of matrix sampling was confined to random sampling but later on other sampling designs, such as stratified sampling, were also used for constructing the test. The stratified item-sampling model was first discussed by Cronbach, Schönemann, and McKie (1965), Rajaratnam, Cronbach and Gleser (1965) and later by Srivastava and Sharma (1975, 1977), and Sharma (1977). But they used this model mainly for estimating true scores and test reliability.

In this paper an attempt has been made to use the matrix sampling models for estimating an individual's true change and the reliability of change scores. We shall first consider the general case in which the two-stage sampling procedure is used for construction of the test. It will be followed by a discussion of stratified and simple random sampling models as particular cases. It is assumed that the same test is used on both the occasions. However, if different but parallel tests are used, it will be necessary to assume that for a given item in the pretest there is a corresponding parallel item in the posttest.

Following Lord (1959), and Srivastava and Webster (1967), the regression of true change score on observed change score is used for estimating the true change. The regression coefficients so obtained under different testing situations are interpretable as the reliability of change scores.

## ESTIMATION OF TRUE CHANGE UNDER MATRIX SAMPLING MODELS

Analysis of variance approach is used for obtaining the estimates of unknown parameters. Expected values of mean squares are given in several texts (e.g. Comfield and Tukey, 1956; Scheffé, 1959; Winer, 1971).

### ASSUMPTIONS AND NOTATIONS

It is assumed that the universe of items (questions) is divided into a finite number of strata (topics) and each stratum consists of a very large (infinite) number of items. First, a sample of strata is selected at random and then from each stratum a predetermined number of items are randomly selected to form the test. This situation of test construction is common in achievement testing and in public examinations.

In this study, the sampling of persons will be called as 'Type 1' sampling, that of strata as 'Type 2' sampling, and that of items as 'Type 3' sampling. Expected values over 'Type 1' sampling will be denoted by  $E_1$ , over 'Type 2' sampling by  $E_2$ , and over 'Type 3' sampling by  $E_3$ .  $E_{23}$  is used to denote the expected values over 'Type 2' and 'Type 3' sampling, whereas  $E_{123}$  denotes the expected value over all the three types of sampling.

The other terms used in discussing the general linear model for the estimation of true change score are as follows:

$X_{psi}$  the observed pretest score of  $p$ th person on  $i$ th item in  $s$ th stratum. Also  $p = 1$  to  $n$ ;  $s = 1$  to  $m$ ; and  $i = 1$  to  $k$ .

$Y_{psi}$  the observed posttest score of  $p$ th person on  $i$ th item in  $s$ th stratum (the item is either the same or a parallel item corresponding to the  $i$ th item in the  $s$ th stratum of the pretest).

$d_{psi}$  the observed difference score of  $p$ th person on  $i$ th item in  $s$ th stratum.

$d_{p..} = \sum_p \sum_i d_{psi}$  the observed total difference score of  $p$ th person.

$\bar{d}_{p..} = \frac{d_{p..}}{mk}$  the observed average difference score of  $p$ th person.

$d_{.s} = \sum_p \sum_i d_{psi}$  the observed total difference score of  $s$ th stratum.

$d_{ps} = \sum_i d_{psi}$	the observed total difference score of $p$ th person in $s$ th stratum.
$d_{si} = \sum_p d_{psi}$	the observed total difference score on $i$ th item in $s$ th stratum.
$d_{...} = \sum_p \sum_s \sum_i d_{psi}$	the overall observed total difference score.
$\bar{d}_{...} = \frac{d_{...}}{nmk}$	the overall observed average difference score.
$D_p = E_{23}(\bar{d}_{p..})$	the true average difference score of $p$ th person.
$D = E_1(D_p)$	the overall true average difference score.
$\sigma^2(D_p) = E_1(D_p - D)^2$	the variance of true average difference scores over persons.
$\sigma^2(\bar{d}_{p..}) = E_{23}(\bar{d}_{p..} - D_p)^2$	the variance of $p$ th person's average difference score under 'Type 2' and 'Type 3' sampling.
$\sigma^2 = E_1\{\sigma^2(\bar{d}_{p..})\}$	the expectation of $\sigma_p^2$ over persons.
$= E_{123}(\bar{d}_{p..} - D_p)^2$	

#### LINEAR MODEL FOR ESTIMATION OF TRUE CHANGE SCORE

The linear model that we consider for estimating true change score of  $p$ th person is

$$D_p + \text{error term} = A + B\bar{d}_{p..} \quad (1)$$

where  $A$  and  $B$  are constants. Following the least square method, the expected squared error

$$S = E_{123}[D_p - A - B\bar{d}_{p..}]^2$$

is to be minimised with respect to  $A$  and  $B$ .

Equating  $\frac{\partial S}{\partial A}$  and  $\frac{\partial S}{\partial B}$  to zero, we get

$$E_{123}(D_p) = A + BE_{123}(\bar{d}_{p..}) \quad (2)$$

and

$$E_{123}(D_p \bar{d}_{p..}) = AE_{123}(\bar{d}_{p..}) + BE_{123}(\bar{d}_{p..})^2 \quad (3)$$

From Equation 2,

$$A = D(1 - B) \quad (4)$$

From Equations 3 and 4,

$$E_1(D_p)^2 - D^2 = B[E_{123}(\bar{d}_{p..})^2 - D^2] \quad (5)$$

since

$$E_{123}(D_p \bar{d}_{p..}) = E_1[D_p E_{23}(\bar{d}_{p..})] = E_1(D_p)^2$$

and

$$E_{123}(\bar{d}_{p..}) = D$$

From Equation 5,

$$B = \frac{E_1(D_p)^2 - D^2}{E_{123}(\bar{d}_{p..})^2 - D^2} = \frac{\sigma^2(D_p)}{E_{123}(\bar{d}_{p..})^2 - D^2} \quad (6)$$

since

$$\sigma^2(D_p) = E_1(D_p - D)^2 = E_1(D_p)^2 - D^2.$$

To determine  $E_{123}(\bar{d}_{p..})^2$ , it may be noted that

$$\sigma_p^2 = E_{23}(\bar{d}_{p..} - D_p)^2 = E_{23}(\bar{d}_{p..})^2 - (D_p)^2$$

and

$$\sigma^2 = E_1(\sigma_p)^2 = E_{123}(\bar{d}_{p..})^2 - E_1(D_p)^2 = E_{123}(\bar{d}_{p..})^2 - \{\sigma^2(D_p) + D^2\}$$

Hence,

$$E_{123}(\bar{d}_{p..})^2 = \sigma^2(D_p) + D^2 + \sigma^2 \quad (7)$$

From Equations 6 and 7, we get

$$B = \frac{\sigma^2(D_p)}{\sigma^2(D_p) + \sigma^2} \quad (8)$$

In Equation 8,  $\sigma^2(D_p)$  and  $\sigma^2$  are the true difference score variance and error variance respectively. And under the assumption that error variance is uncorrelated with true difference score variance, the denominator in Equation 8 gives the observed difference score variance. Thus the regression coefficient  $B$  is also interpretable as the reliability coefficient of the estimate of true change score. The formula for  $B$  in Equation 8 contains unknown population parameters involved in the matrix sampling model. In order to find an estimate of  $B$ , the unbiased estimates of  $\sigma^2(D_p)$  and  $\sigma^2$  are to be substituted in Equation 8 which would be different under different sampling designs used for the construction of the test.

We shall consider the cases when tests are formed by selecting an equal number of items from each stratum.

# ESTIMATION OF PARAMETERS WHEN TESTS ARE FORMED WITH TWO-STAGE SAMPLING MODEL

The unbiased estimates of the population parameters can be obtained by decomposition of total variance into various identifiable component variations. In the present study we assume that a randomly selected set of persons (examinees) is examined on two occasions with either the same test composites or two parallel test composites (with the item of one parallel to the item of the other). We also assume that the selection of items has been made by using the two-stage sampling procedure. That is, first a sample of strata (topics) is selected at random from the universe of topics and then from each topic a predetermined number of items have been randomly selected to constitute the test. The scores thus obtained may be described by a partially nested design  $p \times i(s)$  in which persons( $p$ ) are crossed with items ( $i$ ) and strata ( $s$ ), but items are nested within the strata.

The difference of the scores obtained by  $p$ th person on  $i$ th item of  $s$ th stratum at initial and final stages, designated by  $d_{psi}$  can be decomposed into various components as under:

$$d_{psi} = D + (D_p - D) + (D_s - D) + (D_{si} - D_s) + (D_{ps} - D_p - D_s + D) + (d_{psi} - D_{ps} - D_{si} + D_s) \quad (9)$$

where terms on the right-hand side of Equation 9 are the factorial effects and the residual component. The corresponding decomposition of total variance into component variance will be as follows:

$$\sigma^2(d_{psi}) = \sigma_p^2 + \sigma_s^2 + \sigma_{i(s)}^2 + \sigma_{ps}^2 + \sigma_{i(s)p,e}^2 \quad (10)$$

The residual variation  $\sigma_{i(s)p,e}^2$ , which equals  $\sigma^2(D_{psi} - D_{ps} - D_{si} + D_s) + \sigma_s^2$ , combines the person-item within stratum interaction with variation from unidentified sources. The two parts could be separated only when more than one observation on each factor combination are taken.

On summing the Equation 9 over  $i$  and  $s$ , and then dividing it by  $k$  and  $m$  we obtain

$$(\bar{d}_{p..} - D_p) = \frac{1}{m} \sum_s (D_s - D) + \frac{1}{mk} \sum_s \sum_i (D_{si} - D_s) + \frac{1}{m} \sum_s (D_{ps} - D_p - D_s + D) + \frac{1}{mk} \sum_s \sum_i (d_{psi} - D_{ps} - D_{si} + D_s) \quad (11)$$

Taking the expectation of  $(\bar{d}_{p..} - D_p)^2$  over persons, items and strata, we get

$$E_{123}(\bar{d}_{p..} - D_p)^2 = \sigma^2 = \frac{\sigma_s^2}{m} + \frac{\sigma_{i(s)}^2}{mk} + \frac{\sigma_{ps}^2}{m} + \frac{\sigma_{i(s)p,e}^2}{mk} \quad (12)$$

# ESTIMATION OF TRUE CHANGE UNDER MATRIX SAMPLING MODELS

The variance components in Equations 10 and 12 cannot be observed directly. However, these can be estimated with the help of mean squares obtained in the analysis of variance for the nested-design  $p \times i(s)$ , given in Table 1. Following Winer (1971), the expected values of the mean squares for this design have the form given in the last column of the table. Here the total number of strata (topics) is assumed to be finite (say  $M$ ) whereas the population of persons and of items within each stratum are assumed to be very large.

In Table 1, the symbol  $D_m$  is used to designate the expression  $1 - m/M$ , popularly known as finite population correction (fpc). This factor has to be introduced when the population is finite. Numerically,  $D_m = 0$  when  $m = M$ , and  $D_m = 1$  when  $M$  is quite large as compared to  $m$ .

TABLE 1 ANOVA for $p \times i(s)$ Design with Expected Values of Mean Squares				
Source of Variation	df	Sum of Squares	$MS = SS/df$	Expected Value of Mean Square $E(MS)$
Persons ( $p$ )	$(n - 1)$	$\frac{\sum d_{p..}^2}{p} - \frac{d_{...}^2}{nmk}$	$MS_p$	$\sigma_{i(p),p}^2 + kD_m\sigma_{px}^2 + m\kappa\sigma_p^2$
Strata ( $s$ )	$(m - 1)$	$\frac{\sum d_{.s.}^2}{s} - \frac{d_{...}^2}{nmk}$	$MS_s$	$\sigma_{i(p),s}^2 + \kappa\sigma_{sx}^2 + n\sigma_{(i)}^2 + n\kappa\sigma_s^2$
Items within strata $i(s)$	$m(k - 1)$	$\frac{\sum \sum d_{si.}^2}{s} - \frac{\sum d_{.s.}^2}{nk}$	$MS_{i(s)}$	$\sigma_{i(p),s}^2 + n\sigma_{(i)}^2$
Person $\times$ stratum ( $p \times s$ )	$(n - 1)(m - 1)$	$\frac{\sum \sum d_{ps.}^2}{p} - \frac{\sum d_{.s.}^2}{nk} - \frac{\sum d_{p..}^2}{p} + \frac{d_{...}^2}{nmk}$	$MS_{ps}$	$\sigma_{i(p),p,s}^2 + \kappa\sigma_{ps}^2$
Residual $i(s)p,s$	$m(n - 1)(k - 1)$	$\frac{\sum \sum \sum d_{psi.}^2}{p} - \frac{\sum \sum d_{si.}^2}{s} - \frac{\sum \sum d_{ps.}^2}{p} + \frac{\sum d_{.s.}^2}{nk} - \frac{\sum d_{p..}^2}{p} + \frac{d_{...}^2}{nmk}$	$MS_{(i)p,s}$	$\sigma_{i(s)p,s}^2$
Total	$nmk - 1$	$\sum \sum \sum d_{psi.}^2 - \frac{d_{...}^2}{nmk}$		

From Table 1, the estimated variance components can be written in terms of mean squares as follows:

$$\hat{\sigma}_{I(s)p,e}^2 = MS_{I(s)p,e} \quad (13)$$

$$\hat{\sigma}_{ps}^2 = \frac{MS_{ps} - MS_{I(s)p,e}}{k} \quad (14)$$

$$\hat{\sigma}_{I(s)}^2 = \frac{MS_{I(s)} - MS_{I(s)p,e}}{n} \quad (15)$$

$$\hat{\sigma}_p^2 = \frac{MS_p - MS_{I(s)p,e} - D_m(MS_{ps} - MS_{I(s)p,e})}{mk} \quad (16)$$

$$\hat{\sigma}_s^2 = \frac{MS_s - MS_{ps} - MS_{I(s)} + MS_{I(s)p,e}}{nk} \quad (17)$$

It will be worthwhile to mention here that although variances must be non-negative but in practical situations the estimated values of variance components are sometimes negative. It may be because of the fact that the residual component may be large relative to other mean sum of squares as pointed out by Thompson (1962). In such a situation we will follow the same method, substituting zero for negative estimates, as used by Cronbach et al. (1972).

The estimate of the variance component for persons can be used as an estimate of true change score variance,  $\sigma^2(D_p)$ , that is,

$$\hat{\sigma}^2(D_p) = \hat{\sigma}_p^2 \quad (18)$$

Equation 16 provides the value of  $\hat{\sigma}_p^2$  when  $M$ , total number of strata or topics, is finite. When  $M$  is large as compared to  $m$  it may be possible to treat  $fps = 1$  in which case Equation 16 reduces to

$$\hat{\sigma}_p^2 = \frac{MS_p - MS_{ps}}{mk} \quad (19)$$

In fact, Equation 19 gives the value of  $\hat{\sigma}_p^2$  when stratum factor is random.

Now, replacing different variance components with their respective estimates and using Equations 12 and 18 in Equation 8, a formula for an estimate of  $B$ , designated by  $\hat{B}_1$ , is obtained as follows:

$$\hat{B}_1 = \frac{\hat{\sigma}_p^2}{\hat{\sigma}_p^2 + \frac{\hat{\sigma}_s^2}{m} + \frac{\hat{\sigma}_{I(s)}^2}{mk} + \frac{\hat{\sigma}_{ps}^2}{m} + \frac{\hat{\sigma}_{I(s)p,e}^2}{mk}} \quad (20)$$

$\hat{B}_1$  in Equation 20 is an estimate of the reliability coefficient of change scores when a sampled set of persons is tested on two occasions with either the same set of items or two parallel sets of items selected by using a two-stage sampling procedure.



Using Equations 4 and 20 in Equation 1, the estimate of true change score of  $p$ th person is obtained from the following formula:

$$\hat{D}_p = \bar{d}_{...} + \hat{B}_1(\bar{d}_{p..} - \bar{d}_{...}) \quad (21)$$

#### ESTIMATION OF PARAMETERS WHEN TESTS ARE FORMED WITH STRATIFIED RANDOM SAMPLING MODEL

In the preceding section we have considered a case in which items have been selected not from all the strata but only from the sampled strata. Let us now assume that the selection of items has been made from all available strata, that is, stratum factor is fixed. The resultant design will take the form of stratified random sampling. Thus this design may be considered as a particular case of two-stage sampling design. In this case, factors  $s$  and  $ps$  do not contribute to observed variance. Hence, the terms representing variance components pertaining to factors  $s$  and  $ps$  will disappear from Equation 12 and thus the expression for computing  $\sigma^2$  will reduce to

$$E_{123}(\bar{d}_{p..} - D_p)^2 = \frac{\sigma_{R(s)}^2}{mk} + \frac{\sigma_{R(s)ps,e}^2}{mk} \quad (22)$$

The variance components in Equation 22 can be estimated from the mean squares in Table 1. Their estimates are given in Equations 15 and 13.

Here also, the estimate of the variance component for persons can be used as an estimate of true change score variance, that is,

$$\hat{\sigma}^2(D_p) = \hat{\sigma}_p^2$$

which can be obtained from Equation 16 by putting zero for  $D_m$ , as  $m = M$  in the case of stratified random sampling. Consequently, Equation 16 reduces to

$$\hat{\sigma}_p^2 = \frac{MS_p - MS_{R(s)ps,e}}{mk} \quad (23)$$

Now substituting in Equation 8 the estimated values of the variance components obtained from Equations 13, 15 and 23, an estimate of  $B$ , designated by  $B_2$ , is obtained from the following formula:

$$\hat{B}_2 = \frac{\hat{\sigma}_p^2}{\hat{\sigma}_p^2 + \frac{\hat{\sigma}_{R(s)}^2}{mk} + \frac{\hat{\sigma}_{R(s)ps,e}^2}{mk}} \quad (24)$$

The estimate of true average change score of  $p$ th person can be obtained from the following formula:

$$\hat{D}_p = \bar{d}_{...} + \hat{B}_2(\bar{d}_{p..} - \bar{d}_{...}) \quad (25)$$

# ESTIMATION OF PARAMETERS WHEN TESTS ARE FORMED BY RANDOM SELECTION OF ITEMS

We may now consider the simplest case in which items are selected at random from a universe of items. It amounts to having a single stratum from which, suppose,  $k$  items are selected at random and the test is administered to  $n$  persons. This design will take the form of two-factor matrix sampling design in which both the factors, namely, person and item, are random. This becomes a particular case of the stratified sampling design. The expected values of the mean squares for the new design are summarised in Table 2.

TABLE 2 ANOVA for Person $\times$ Item Design with Expected Values of Mean Squares				
Source of Variation	df	Sum of Squares (SS)	MS = SS/df	Expected Values of Mean Squares $E(MS)$
Persons ( $p$ )	$n - 1$	$\frac{\sum d_p^2}{p} - \frac{d_{..}^2}{nk}$	$MS_p$	$\sigma_{p\cdot, e}^2 + k\sigma_p^2$
Items ( $i$ )	$k - 1$	$\frac{\sum d_i^2}{i} - \frac{d_{..}^2}{nk}$	$MS_i$	$\sigma_{p\cdot, e}^2 + n\sigma_i^2$
Residual $p \times i, e$	$(n - 1)(k - 1)$	$\sum_p \sum_i d_{pi}^2 - \frac{\sum_i d_i^2}{n} - \frac{\sum_p d_p^2}{k} + \frac{d_{..}^2}{nk}$	$MS_{p\cdot, e}$	$\sigma_{p\cdot, e}^2$
Total	$nk - 1$	$\sum_p \sum_i d_{pi}^2 - \frac{d_{..}^2}{nk}$		

The notations used in this section are explained below:

$d_{pi}$  observed difference score of  $p$ th person on  $i$ th item;  
 $p = 1$  to  $n$ ;  $i = 1$  to  $k$ .

$d_p = \sum_i d_{pi}$  observed total difference score of  $p$ th person.

$\bar{d}_p = \frac{\sum_i d_{pi}}{k}$  observed average difference score of  $p$ th person.

$d_i = \sum_i d_{pi}$  observed total difference score on  $i$ th item.

$d_{..} = \sum_p \sum_i d_{pi}$  overall observed total difference score.

$\bar{d}_{.i} = \frac{\sum_p \sum_i d_{pi}}{nk}$  overall observed average difference score.

From Table 2, the estimated value of different variance components are given below:

$$\hat{\sigma}_{pi,e}^2 = MS_{pi,e} \quad (26)$$

$$\hat{\sigma}_i^2 = \frac{MS_i - MS_{pi,e}}{n} \quad (27)$$

$$\hat{\sigma}_p^2 = \frac{MS_p - MS_{pi,e}}{k} \quad (28)$$

Again,  $\hat{\sigma}_p^2$  can be used as an estimate of  $\sigma^2(D_p)$  and  $\sigma^2$  can be estimated from the following formula:

$$\hat{\sigma}^2 = \frac{\hat{\sigma}_i^2}{k} + \frac{\hat{\sigma}_{pi,e}^2}{k} \quad (29)$$

Now, substituting the estimated values of  $\sigma^2(D_p)$  and  $\sigma^2$  in Equation 8 we get an estimate of  $B$ , designated by  $B_3$ , from the following formula:

$$\hat{B}_3 = \frac{\hat{\sigma}_p^2}{\hat{\sigma}_p^2 + \frac{\hat{\sigma}_i^2}{k} + \frac{\hat{\sigma}_{pi,e}^2}{k}} \quad (30)$$

Equation 30 can also be obtained from Equation 24, meant for estimating the regression in the case of stratified random sampling model, by considering just one stratum.

The formula for estimating the true average difference score of  $p$ th person becomes

$$\hat{D}_p = \bar{d}_{..} + \hat{B}_3(\bar{d}_{p..} - \bar{d}_{..}) \quad (31)$$

### NUMERICAL EXAMPLE

We shall now consider a numerical example for showing computations of different variance components and estimating from them the reliability

TABLE 3  
Data for Numerical Example

TABLE 3 Data for Numerical Example														
Score	Person	Stratum 1				Stratum 2				Stratum 3				Total
		Item		Total	Item		Total	Item		Total				
		1	2		3	1		2	3		1	2	3	
X	1	4	5	4	13	3	3	5	11	4	5	7	16	40
	2	2	1	2	5	2	3	1	6	4	4	6	14	25
	3	2	4	3	9	4	7	6	17	5	8	7	20	46
	4	1	3	4	8	5	4	5	14	5	4	5	14	36
	5	3	3	2	8	6	7	5	18	7	8	9	24	50
	6	1	2	3	6	5	6	4	15	4	5	6	15	36
	7	3	5	2	10	6	8	6	20	7	7	8	22	52
	8	0	1	4	5	1	2	0	3	4	7	8	19	27
Y	1	6	6	7	19	7	6	7	20	6	7	8	21	60
	2	5	3	5	13	5	6	4	15	5	6	8	19	47
	3	4	6	5	15	7	9	8	24	7	9	7	23	62
	4	3	5	6	14	7	7	7	21	7	5	7	19	54
	5	4	4	4	12	8	8	7	23	8	8	9	25	60
	6	2	4	5	11	7	8	5	20	6	6	7	19	50
	7	5	7	5	17	8	9	8	25	9	8	9	26	68
	8	3	3	5	11	4	5	3	12	6	9	9	24	47
Y - X = d	1	2	1	3	6	4	3	2	9	2	2	1	5	20
	2	3	2	3	8	3	3	3	9	1	2	2	5	22
	3	2	2	2	6	3	2	2	7	2	1	0	3	16
	4	2	2	2	6	2	3	2	7	2	1	2	5	18
	5	1	1	2	4	2	1	2	5	1	0	0	1	10
	6	1	2	2	5	2	2	1	5	2	1	1	4	14
	7	2	2	3	7	2	1	2	5	2	1	1	4	16
	8	-3	2	1	6	3	3	3	9	2	2	1	5	20
Total		16	14	18	48	21	18	17	56	14	10	8	32	136

coefficients and individuals' true change scores under different sampling models. For this purpose, suppose a test of nine items, comprising three randomly selected items from each of three sampled strata, is administered to eight persons on two occasions. Also, suppose that the scores obtained by the individuals on each item may range between 0 and 10. The scores (hypothetical) obtained by each individual on occasion 1 and 2 along with the corresponding itemwise difference scores are given in Table 3.

Using the data of Table 3, we now compute the sum of squares given in Table 1 which will later be used for estimating different variance components.

$$\begin{aligned} \frac{\sum d_{p..}^2}{nmk} &= 256.889; \quad \frac{p}{mk} = 268.444 \\ \frac{\sum d_{s.}^2}{nk} &= 269.333; \quad \frac{\sum \sum d_{si}^2}{n} = 273.750 \\ \frac{\sum \sum d_{ps.}^2}{k} &= 285.333; \quad \sum \sum \sum d_{psi}^2 = 304 \end{aligned}$$

#### Case I: Two-stage Sampling Model

In the case of two-stage sampling model we get from the data in Table 3, the mean sum of squares presented in Table 4. The sum of squares is obtained by the relations given in Table 1. Here  $M = 10$  and  $m = 3$ .

TABLE 4 Summary of Analysis of Variance			
Source of Variation	df	Sum of Squares (SS)	Mean Sum of Squares (MS)
Persons (p)	7	11.555	1.651
Strata (s)	2	12.444	6.222
Items within strata i(s)	6	4.417	0.736
Person $\times$ stratum (p $\times$ s)	14	4.445	0.318
Residual i(s) $\times$ p, s	42	14.250	0.339
Total	71	47.111	

From Table 5 we obtain the estimated values of various variance components by using Equations 26, 27 and 28 as follows:

$$\hat{\sigma}_{\pi, \epsilon}^2 = 0.334$$

$$\hat{\sigma}_t^2 = \frac{2.108 - 0.334}{8} = 0.2218$$

$$\hat{\sigma}_p^2 = \frac{1.651 - 0.334}{9} = 0.1463$$

Substituting the estimated values of variance components in Equation 30, we get

$$\hat{B}_3 = \frac{0.1463}{0.1463 + \frac{0.2218}{9} + \frac{0.334}{9}} = 0.7030$$

Finally, from Equation 31

$$\hat{D}_p = \bar{d}_{..} + \hat{B}_3(\bar{d}_p - \bar{d}_{..}) = 1.89 + 0.7030(\bar{d}_p - 1.89)$$

The estimated values of individuals' true change scores are shown in Table 6.

TABLE 6 Estimated Values of True Change under Various Sampling Models				
Person	Observed Average Difference Score	Estimated Value of True Change when Items are Selected with		
		Two-stage sampling	Stratified sampling	Simple random sampling
1	2.22	2.072	2.145	2.122
2	2.44	2.194	2.314	2.277
3	1.78	1.829	1.805	1.813
4	2.00	1.951	1.975	1.967
5	1.11	1.460	1.288	1.342
6	1.56	1.708	1.635	1.658
7	1.78	1.829	1.805	1.813
8	2.22	2.072	2.145	2.122

We now compare the results obtained in the numerical example under various sampling models. It is observed that the value of  $\hat{B}_2$ , an estimate of the reliability of true change in the case of stratified random sampling model, is 0.7714 which is greater than both  $\hat{B}_3$  (= 0.7030) and  $\hat{B}_1$  (= 0.5519), the estimates of reliability coefficients when test items are selected at random and by using the two-stage

sampling procedure, respectively. These results are consistent with the sampling theory results (e.g. Cochran, 1977).

In the two-stage sampling model the variance for the estimated mean or total is greater than that obtained for the stratified sampling model due to further addition of between strata variance and this increase in the variance will tend to reduce the reliability of true change.

Although stratified random sampling does not necessarily provide a smaller variance than a simple random sample, proper use of stratification nearly always results in a smaller variance for the estimated mean or total than is given by a simple random sample. This will tend to increase the reliability of true change scores obtained by using stratified random sampling in comparison to that obtained under a simple random sampling model.

### SUMMARY AND CONCLUSIONS

This paper deals with the problem of estimating individuals' true change when the test score of an examinee is the sum of item scores, taking into consideration the source of variation due to sampling of items in the model. Following Lord (1959) and Srivastava and Webster (1967), the regression of true change score on observed change score is used for estimating the true change. The method of least squares estimates has been used to estimate the unknown parameters. The regression coefficient comes out to be the ratio of variances, namely, the true change score variance and the variance of observed change scores. Thus the regression coefficient so obtained is interpretable as the reliability of change scores.

Three sampling designs, namely two-stage sampling, stratified sampling and simple random sampling have been employed for selecting the test items from a universe of possible test items. It has been assumed that either the same test or two parallel tests have been administered on both the occasions. For each sampling design estimates of various variance components have been worked out which can be computed from the various mean sum of squares obtained in the ANOVA table.

A numerical example with hypothetical data has been considered for illustration purposes. It has been found that amongst the three sampling models considered here, the stratified random sampling model provides the highest reliability of true change score followed by the simple random sampling and two-stage sampling models.

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## Interdomain Relationship between Creativity and Intelligence by Canonical Analysis

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The relationship between creativity and intelligence domains has been conventionally investigated by the use of some factor analytic method. It is a powerful multivariate statistical technique which can be used to study the relationship between creativity and intelligence. In the present study a correlation analysis was conducted to study the relationship between creativity and intelligence has been analysed with the canonical analysis technique. The results support the existence of the three conventionally observed factorial dimensions, viz. (i) a comprehensive dimension of 'general intelligence', and (ii) two dimensions of creativity—one underlying verbal and the other non-verbal creative thinking abilities. In addition to these results, the canonical analysis yields a basis for the conclusions that (a) the measures of creativity domain can explain eight per cent variance of the measures of intelligence domain and vice-versa, and (b) the group factor of 'general intelligence' can explain only 6.5 per cent of the total variance of 'creativity' and the corresponding group factor of verbal creativity explains only 7 per cent of the total variance of intelligence. Thus, the present study establishes beyond doubts the factorial structure of creativity and intelligence across a distinct statistical analysis procedure such as the canonical analysis. Further the 'individual' as well as the 'total' redundancy measures in the canonical analysis powerfully establish that the relationship (though low) between the two domains of creativity and intelligence is of symmetric nature, i.e. the presence of either kind of abilities facilitates the foreplay of the other kind of abilities.

THE interdomain relationship between creativity and intelligence has been conventionally investigated by the use of some factor analytic approach. However, this approach is known to have its own limitations. Canonical analysis (Hotelling, 1936) is yet another available powerful multivariate statistical technique that has been specifically developed long ago to deal with the problems such as that of interdomain relationship. Love and Miller (1966) have further significantly contributed to the development of theoretical framework of Hotelling's canonical correlation analysis technique by introducing the use of 'individual' and 'total' redundancy coefficients. This powerful multivariate statistical technique has not able to obtain its due place in the reported/published literature pertaining to studies involving an examination of relationship between the psychological domains of creativity and intelligence.

It may be observed that when the variables logically or experimentally belong to two domains such as creativity and intelligence, canonical analysis may be an alternative or even preferable method as compared to the factor analytic approach. While recommending the use of the canonical analysis procedure in studies involving an analysis of interdomain dimensions, Hotelling (1967) comments, "a use sometimes made for factor analysis in the past is in testing for the relations between two sets of variates ... This kind of use of factor analysis should clearly be superseded by an examination of canonical correlations between two sets of variates." Further, several renowned statisticians and psychometricians, e.g. Hotelling (1936, 1957), Bartlett (1948), Kshirsagar (1978) and Hakslian and Cattell (1978) have been recommending its use in studies involving an examination of relationships between two or more domains. Also, it seems that factor analysis may be more appropriate for hypothesis generating and exploratory studies while canonical analysis may have wider applications in research involving hypothesis testing and prediction.

The reasons for so strong arguments in favour of the use of the canonical analysis (CA) technique lie in the fact that it involves a complex array of useful statistics (coefficients) such as squared canonical correlations (SCC's), pairs of corresponding interrelated factors, variances being explained by a factor in each pair and 'individual' and 'total' redundancy coefficients (Love and Miller, 1966). These statistics conjointly help in interpreting the results and in drawing meaningful conclusions, many of which are just not at all possible with the use of the factor analytic approach because the latter approach is not equipped with such a plethora of powerful summary statistics which only the CA technique has within its ambit.

## THE RESEARCH QUESTIONS

Thus, in view of the availability of a complex array of statistical measures (statistics) within the ambit of the canonical analysis technique, it seems that the

relationship between creativity and intelligence domains may perhaps be more appropriately, precisely and rigorously investigated by the multivariate statistical analysis technique embodied in the theoretical conceptual framework of canonical analysis. Also, in view of the CA technique being applied in the present study and availability of various statistics such as SCC's,  $P_1$ —pairs of factors,  $P_2$ —pairs of individual redundancy coefficients ( $P_2 \leq P_1$ ), one pair of the total redundancy coefficients and their capability to throw light on the various aspects of creativity-intelligence relationship, the following research questions are being examined/proposed :

1. Are there some statistically significant SCC's yielding bases for the examination of the corresponding pairs of canonical factors which may serve the purpose of interdomain dimensions?
2. Are the pairs of canonical factors psychologically (meaningfully) interpretable?
3. What is the percentage of variances that can be explained via the statistically significant canonical factors of creativity, of the intelligence domain?
4. What is the percentage of variances that can be explained via the statistically significant canonical factors of intelligence, of the creativity domain?
5. What is the total extent to which the variance of the measures of creativity domain can be accounted for by the canonical factors of intelligence domain and vice-versa?

The factor analytic approach is obviously, by virtue of its nature itself, incapable of probing some of such research questions, and therefore, the use of the canonical analysis technique has been invoked in the present study.

## OPERATIONAL DEFINITIONS AND DESCRIPTION OF DATA

### 1. Creativity

Creativity as defined by Torrance (1962) refers to both verbal and non-verbal creativity as measured by fluency, flexibility and originality (verbal creativity), and fluency, flexibility, originality and elaboration (non-verbal creativity). Verbal Creativity is measured by Torrance Tests of Creative Thinking (TTCT) Verbal Form A (Torrance, 1966a) yielding scores for fluency, flexibility and originality. Non-verbal creativity is measured by the battery of Figural Tests of Creative Thinking (Torrance, 1966b) yielding scores for non-verbal fluency, flexibility, originality and elaboration.

## 2. *Intelligence*

It represents both verbal and non-verbal intelligence. In the present study, verbal intelligence is being measured by Jalota Singh's (1967) Test of General Mental Verbal Ability (2/60) which comprises seven sub-tests, viz. of number series, classification, best answer, reasoning, analogies, vocabulary and synonyms and opposites. Non-verbal intelligence is being measured by Raven's (1960) Standard Progressive Matrices. It yields one measure of non-verbal intelligence.

## RESULTS

The correlation matrix of the fifteen measures of creativity and intelligence was subjected to analysis with the help of a computer programme (cf. Cooley and Lohnes, 1971) and the results obtained. In what follows we at first present the results and interpret the same.

The canonical analysis of creativity and intelligence domains yielded seven pairs of interdomain dimensions with the squared canonical correlations as: 0.182, 0.050, 0.039, 0.018, 0.007, 0.003, and 0.0002. However, Bartlett's (1941, 1947) test of significance reveals that only the first three canonical correlations are statistically significant at five per cent level of significance.

The factor structure coefficients corresponding to only the first three pairs of canonical dimensions for creativity and intelligence are given in Table 1. However, in Table 2 variances and redundancy coefficients corresponding to all the seven pairs of canonical factors are presented.

## DISCUSSION OF RESULTS

### *First Pair of Canonical Factors*

Factor I (cf. Table 1) in creativity domain has significant loadings on all its measures except on flexibility measure of non-verbal creative thinking abilities. However, on this factor the three measures fluency, flexibility and originality of divergent thinking verbal abilities have markedly dominant loadings as compared to the non-verbal creativity measures and, therefore, in view of such dominant loadings the factor may be named as 'Group Factor of Verbal Creativity'. Further, this factor lends some support to the conjoint functioning of the two kinds of creative thinking (verbal and non-verbal) abilities to some extent. Verbal creative abilities seem to be always facilitated by the presence of non-verbal creative thinking abilities and vice-versa.

TABLE 1  
Factor Structure Coefficients

S. No.	Creativity Measures	Factor I	Factor II	Factor III	S. No.	Intelligence Measures	Factor I	Factor II	Factor III
1.	Verbal Fluency	-0.69	0.52	-0.10	1.	Non-verbal Intelligence	-0.71	0.40	0.15
2.	Verbal Flexibility	-0.89	0.12	0.16	2.	Number Series	-0.61	0.45	0.78
3.	Verbal Originality	-0.79	0.25	0.23	3.	Classification	-0.70	0.36	0.03
4.	Non-verbal Fluency	-0.19	0.63	0.56	4.	Best Answer	-0.69	0.26	-0.27
5.	Non-verbal Flexibility	-0.36	0.39	-0.16	5.	Reasoning	-0.63	0.05	0.08
6.	Non-verbal Originality	-0.46	0.44	0.04	6.	Analogies	-0.31	0.42	0.22
7.	Non-verbal Elaboration	-0.42	0.29	-0.38	7.	Vocabulary	-0.74	0.28	0.12
					8.	Synonyms-Opposites	-0.40	0.57	0.53

TABLE 2  
Variance and Redundancy Coefficients  
(All Values are Proportions)

Factor No.	Creativity		Intelligence	
	Variance Extracted	Redundancy	Variance Extracted	Redundancy
1.	0.354	0.065	0.384	0.070
2.	0.169	0.008	0.146	0.007
3.	0.084	0.003	0.073	0.003
4.	0.157	0.003	0.073	0.001
5.	0.072	0.001	0.083	0.001
6.	0.113	0.000	0.087	0.000
7.	0.051	0.000	0.064	0.000
Total Variance Extracted = 1.000			Total Variance Extracted = 1.000	
Total Redundancy for Creativity given Intelligence = 0.080			Total Redundancy for Intelligence given Creativity = 0.080	

Factor I of intelligence domain (cf. Table 1) corresponding to Factor 1 of creativity domain has loadings varying from marginally significant to quite high loadings on the measure of non-verbal intelligence and the seven measures of verbal intelligence.

The various coefficients presented in Table 2 throw further light on this pair of canonical factors. The first canonical factor of creativity i.e. Group Factor of Verbal Creativity extracts 35 per cent of its total variance, whereas the corresponding dimension (the first canonical factor) of general intelligence accounts for about 42 per cent of its total variance. However, the total redundancy coefficients reveal that only eight per cent of the total variance of all creativity measures can be explained by all intelligence measures and only 8.3 per cent of the total variance of intelligence measures can be explained by creativity measures. But the redundancy coefficients corresponding to the first canonical relation reveal that general intelligence explains only 6.5 per cent of the total variance of creativity and the corresponding Group Factor of Verbal Creativity explains only seven per cent of the total variance of intelligence. Thus the bulk of the total overlapping variance (redundancy) is packed into the first pair of canonical factors.

### *Second Pair of Canonical Factors*

Factor II in creativity domain (cf. Table 1) has significant loadings on verbal fluency and on all measures except elaboration measure which has a loading of .29, of non-verbal creativity.

The second canonical factor of creativity on the whole is a Group Factor of Non-verbal Creativity. Factor II in intelligence domain (cf. Table 1) has meaningful loadings on all measures of intelligence except reasoning sub-test of verbal intelligence. This factor seems to yield basis for the conceptualization of a 'weak' dimension of general intelligence dominated by abilities of verbal comprehension and that of numerical operations.

The squared canonical correlation of the second pair of canonical factors reveals that only five per cent variance of Group Factor of Non-verbal Creativity can be explained by the second factor of intelligence (i.e. by the above-mentioned weak dimension of general intelligence) and vice-versa.

Further, the variance coefficients (cf. Table 2) corresponding to the second pair of canonical factors reveals that this pair of canonical dimensions extracts about 17 and 15 per cent of the total variances of creativity and intelligence, respectively. However, the redundancy coefficients corresponding to the second pair of canonical factors reveal that hardly one per cent variance of creativity domain can be explained through the second dimension of intelligence and also hardly one per cent variance of intelligence domain can be explained via the second dimension of creativity.

### *Third Pair of Canonical Factors*

An overall examination of the size of SCC, factor structure coefficients (cf. Table 1) and redundancy coefficients (cf. Table 2) concerning the third pair of canonical factors reveals that the canonical factors in this pair are, in reality specific battery factors.

### CONCLUSIONS

The canonical analysis (CA) of these two domains reveals that the first three canonical relations are statistically significant at five per cent level of significance. However, only the first two pairs of factors have been found of major psychological interest. These pairs of canonical factors\* yield basis for the conceptualization of interdomain dimensions in terms of (i) a Group Factor of Verbal Creative Thinking Abilities and a Group Factor of General Intelligence; (ii) a Group Factor of Non-verbal Creative Thinking Abilities and somewhat 'weak' dimension of General Intelligence dominated by abilities of verbal comprehension and numerical operations; (iii) General intelligence can predict only 6.5 per cent of the total variance of creativity and the corresponding Group Factor of verbal creativity can explain only seven per cent of the total variance of intelligence; (iv) Either factor in the second pair (as mentioned in ii) can account for only one per cent variance of the other domain.

Further, the 'individual' and the 'total' redundancy coefficients assists to clarify much of the controversy in respect of the extent of creativity-intelligence relationship. The squared canonical correlations yield an exaggerated picture of domain overlap which, however, has been found to be relatively quite low by the redundancy coefficients. An overall examination of these redundancy coefficients along with the corresponding factors obtained clearly establish that creative thinking and convergent thinking abilities are of multifactorial nature but at the same time these abilities are only partially independent and once again support the conclusion that creative thinking and convergent thinking are two distinguishable modes of intellectual functioning which, however, have some overlapping common variance as well.

The total redundancy coefficients for creativity as well as for intelligence clearly reveal that either kind of intellectual ability (convergent or divergent) is equally potent to some extent to bring forth to play the other kind of ability and;

\* It may be observed that this correlation matrix of creativity and intelligence measures has also been analysed with three factor analytic procedures, namely alpha factor analysis, principal factor analysis and alphamax factor analysis. The three factor matrices obtained as such have been further subjected to promax rotation. These results also support the existence of three dimensions of creativity and intelligence (cf. Yesh Pal, 1986, 1990).



## INTERDOMAIN RELATIONSHIP BETWEEN CREATIVITY AND INTELLIGENCE

thus, the present finding supports a view point expressed by Yamamoto (1964) who (in his own study) observes low and nonsignificant ' $r$ ' between IQ and creativity scores but says that "this does not mean that one can necessarily be creative without some minimum intelligence, or vice-versa".

The published literature does not perhaps seem to contain any reference reporting the application of the CA technique in any investigation involving creativity-intelligence relationship and, therefore, it is not possible to provide a direct linkage of the present canonical results with some earlier similar empirical investigation. However, the replication of the three mentioned broad factors across a distinct statistical analysis procedure such as canonical analysis developed to serve altogether distinct purposes, further evidences the robustness of the generally obtained factorial structure of convergent and divergent thinking abilities.

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# **Development of Skills in a Mentally Retarded Child: The Effect of Home Training**

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As countries like India have inadequate number of special educational facilities, training of parents to educate the mentally retarded child at home can be considered as an alternative. This study reports an attempt to train a child with moderate mental retardation in a few skills in the home setting. The training programme included systematic assessment and programming for the child with appropriate IEP. The father of the child was given instructions in a phased manner to train the child at home. At the end of the training period, it was found that the child had effectively learnt the skill and had generalized easily, probably due to the training in natural situation where the transfer of learning is minimal. After the training, the father was also able to teach new skills without involving the trainer.

**T**HE services for the mentally retarded individuals are provided predominantly by schools. In a country like India where there is dearth of qualified special educators, there are alternate service facilities to reach out to a larger target population. Such services include home-based training programmes, center-based service programmes and community-based rehabilitation services. In contrast to the school-based training, these services require active participation of the family members in the training of the mentally retarded child. The efficacy of these training programmes depends on the effectiveness and cooperation of the family. There is evidence that parents can be effective teachers for their retarded children (Sandler and Coren, 1981; Jenkins, Stephens and Sternberg, 1980; Sherin, 1983).

As rightly noted by Porcella (1980), parents may be actively involved in planning their mentally retarded child's school programme and implementing it at home. Parent training would be of much use to those children who require basic skills as self-feeding and toilet training.

However, Jenkins, Stephens and Sternberg (1980) caution that to avoid unfortunate negative interaction among parents and professionals, efforts need to be made to enlist the services of parents in supplying direct training to other parents.

The present study explores the feasibility of systematic training of parents in enhancing skill development in a mentally retarded child.

## METHODOLOGY

### *Subject*

The subject was a moderately retarded female child, aged 5 years and 7 months, with no other associated physical handicap or medical problems. She was the first of the two children of educated parents, living in an extended family with grandparents.

### *Procedure*

After preliminary assessment of the child in medical, psychological and educational aspects, a preprimary level checklist developed at the National Institute for the Mentally Handicapped (NIMH) was used to find out her level of functioning in various skill areas. She was also assessed in detail for her current level of functioning to develop an IEP. The goals included squeezing water from clothes and reading her name.

The NIMH offers a home-based training programme as one of its service delivery systems. The parents were, therefore, oriented about the training and a systematically written IEP with details on steps for training in home setting was

# DEVELOPMENT OF SKILLS IN A MENTALLY RETARDED CHILD

TASK ANALYSIS RECORD																
Task: Squeezing Cloth to Remove Water										Name of the Child: K. Vinea						
Condition: When a bucket full of water with the cloth in it is given	Date		23-8-88			30-8-88			13-9-88			20-9-88			27-9-88	
	Session		I			II			III			IV			V	
Trial	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	
1. Reach for the bucket	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
2. Put the hand inside the bucket	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
3. Take the cloth out from the bucket	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
4. Hold the cloth by two hands	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
5. Start rotating the hand in opposite direction to squeeze cloth	+	+	+	-	PP	+	+	+	+	+	+	+	+	+	+	+
6. Squeeze the cloth in opposite direction	PP	PP	PP	-	-	PP	C	C	C	C	C	C	+	+	+	+
7. Stop when the water stops dripping	-	-	-	-	-	-	-	+	+	+	+	+	-	-	VP	VP
8. Take the cloth to the hanging wire	-	-	-	+	+	+	VP	+	+	VP	VP	VP	VP	VP	VP	+
9. Put the cloth on the wire	-	-	-	+	+	+	+	+	+	+	+	+	+	+	+	+
10. Spread the cloth to remove creases	-	-	-	+	+	+	+	+	+	+	+	+	+	+	+	+
No. of successes	5	5	5	7	7	8	7	9	9	8	8	8	8	8	8	9
Percentage	50%	50%	50%	70%	70%	80%	70%	90%	90%	80%	80%	80%	80%	80%	80%	80%
Remark																
Key: PP — Physical Prompting VP — Verbal Prompting C — Cueing																

FIG. 1

provided to the parents. The steps were demonstrated to the parents and care was taken to see that they understood, by requesting them to show what they had understood. The parents, usually the father, visited the NIMH every week to report progress and take new programmes. Each session lasted about 45 minutes to one hour, for a duration of five months. Two skills, namely (1) squeezing water from the cloth, and (2) reading her name were taken simultaneously for training. The progress was assessed by the trainer by directly observing and recording in the task analysis sheet (Figures 1, 2 and 3).

As the child progressed and maintained 80 per cent accuracy in a skill, generalization of the learnt skill was taught.

## RESULTS

Figures 4, 5, 6 and 7 depict the progress shown by the child in both the skills. Figure 8 shows the comparison of the child's achievement in preprimary checklist at entry and after the training. It is evident that though the chosen skills to be trained were only two, there is an improvement in the overall development in all areas.

### *Skill One — Squeezing Cloth to Remove Water*

It is seen that the baseline was at 50 per cent and in (Fig. 4) three sessions with three trials each, the child had reached 90 per cent accuracy in the skill. With minor fluctuations, she could maintain the skill in generalized situations such as washing different clothes in various settings, using different containers. This shows that the skill was learnt effectively by the child. On a follow-up after a month of completion of the training, the father reported that the child had maintained the skill and had been effectively implementing the learnt skill at home.

### *Skill Two — Identifying Her Name*

Figure 5 shows that the baseline for the skill of identifying her own name was at 25 per cent which raised to 50 per cent by the end of the second session. By the third session the child had achieved 75 per cent and maintained between 80 per cent and 100 per cent success from the fourth session onwards. As a next phase, she was trained to match the alphabets in her name when given in order, followed by the alphabets given jumbled. Figure 6 and Figure 7 give the details on the percentage of success in both the skills. It is seen that within three sessions and six trials she had gained 100 per cent accuracy in matching the alphabets of her name and maintained through the rest of the six sessions.

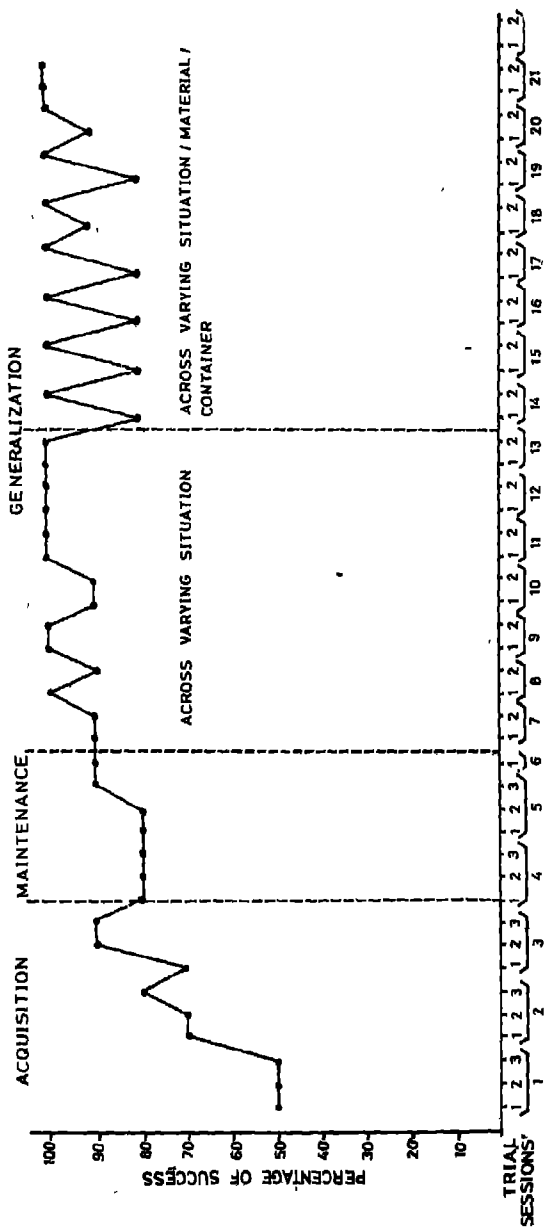


FIG. 4 Progress in Skill 1: Squeezing Water from the Cloth

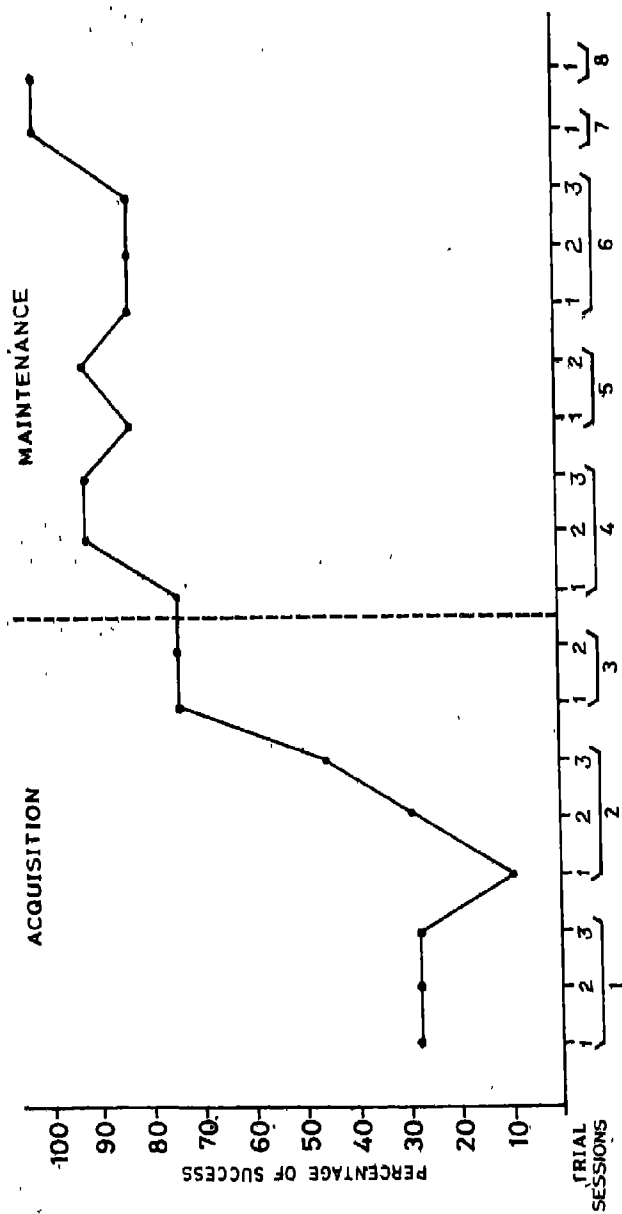


Fig. 5 Progress in Skill 2: Identifying Her Name



# DEVELOPMENT OF SKILLS IN A MENTALLY RETARDED CHILD

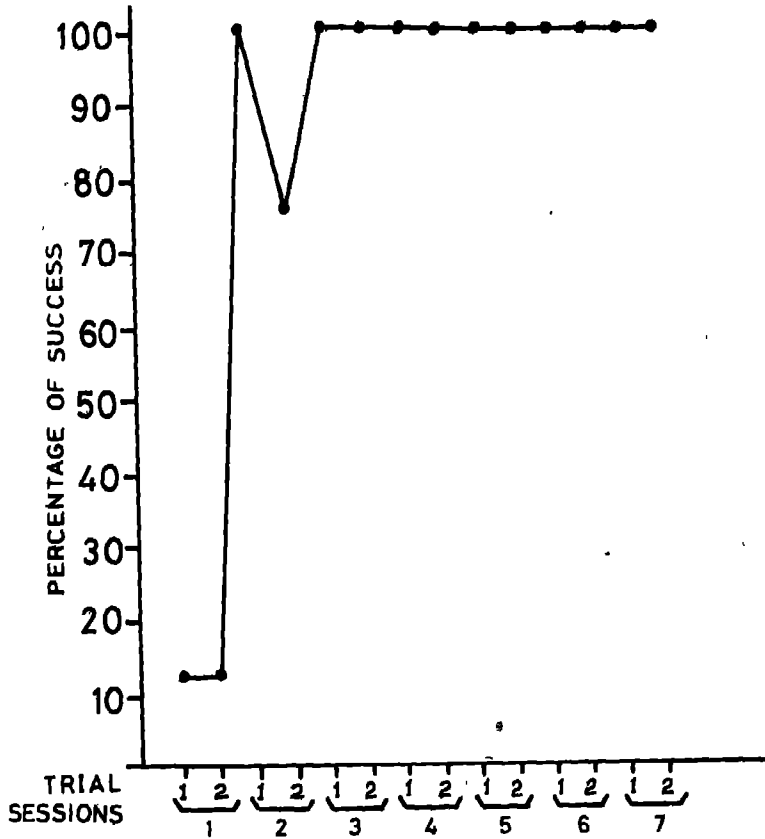


FIG. 6 Skill 2: Progress in Matching Letters of the Name when Given in Order

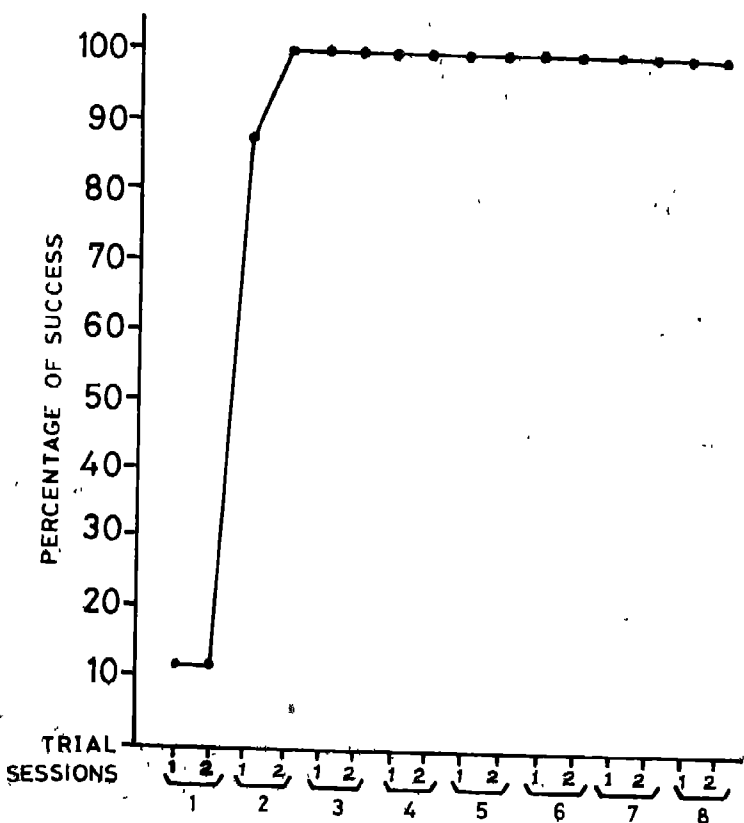
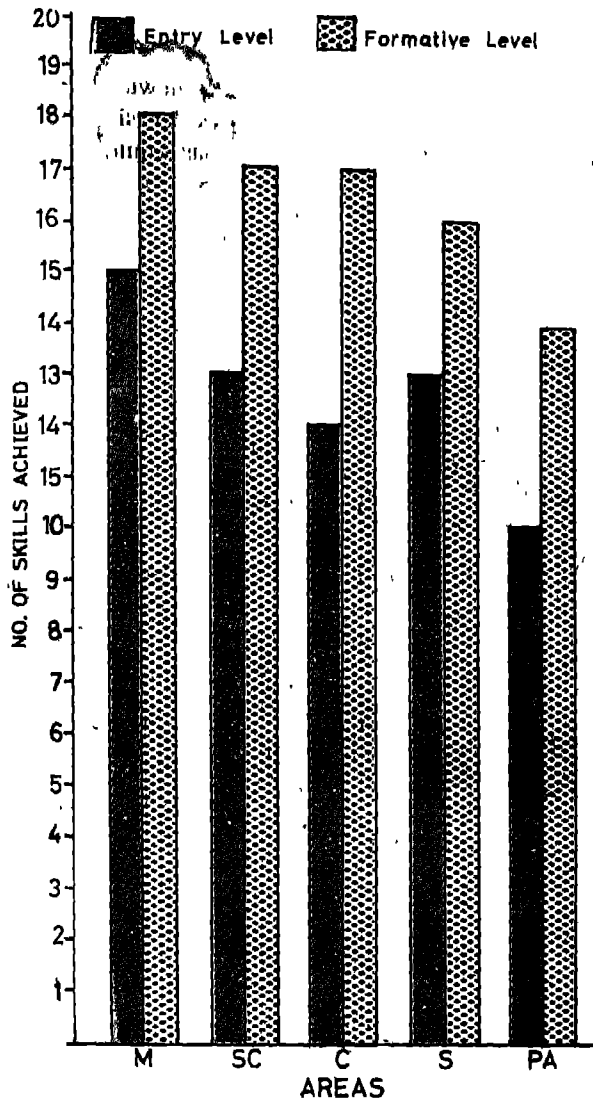


Fig. 7 Skill 2: Progress in Matching Letters of the Name when Given Jumbled

# DEVELOPMENT OF SKILLS IN A MENTALLY RETARDED CHILD



M = Motor Skills      SC = Self Care Skills      C = Communication Skills  
 S = Social Skills      PA = Pre Academic Skills

Fig. 8 Entry Level and Formative Level in the Preprimary Checklist

## DISCUSSION

Training the moderately retarded child by the parent with the necessary professional assistance in special education on a once-a-week basis has proved to be very effective in this given case. As it is seen, the child has acquired and maintained the skills and, where possible, the skill has been generalized also. On discussion with the father, who trained the child, it was found that he enjoyed training his daughter and it was not difficult for him as the training was in home setting and informal, and yet systematic. He could maintain records also for which his education, motivation and enthusiasm in training the daughter could be contributing factors. After training the child on identifying her own name, the father selected a few commonly used survival words by himself. He trained the child successfully to read those words in the same manner like he taught identifying her own name. For teaching the survival words, he did not receive any professional assistance from the Institute. This has resulted in negative teaching to the father, i.e. training trial in which the learner does not perform the target response. Negative training examples will be most effective if they are selected in such a way that they share as many stimulus characteristics as possible with positive examples (Engelmann and Carnine, 1982). The use of negative training examples should result in a sharpening of the stimulus control developed as part of training (Terrace, 1966). The study by Horner, Albin and Ralph (1986) on negative teaching in grocery item selection for the mentally retarded individuals showed that the training with the minimally different negative examples was functionally found to be related to improved rejection of non-trained negative items in the non-trained store. However, in the present study negative teaching had been for the father which had been effective. After fading the assistance from the Institute, the follow-up of the subject after a gap of six months showed that the child had shown considerable improvement in reading various words and also performing the domestic skill of washing and rinsing clothes.

## CONCLUSION

If home training should prove successful, it is absolutely essential that (a) the parents/caretakers must be motivated to train the child, (b) the programme given to the parents should be systematically developed, (c) the programme be given in a phased manner and demonstrated to the parents, (d) the language used in giving instructions to the parents should be totally jargon-free and simple, and (e) the follow-up should be regular. The goals chosen should be the priority goals and essentially the ones felt as priority by the parents. The factors relating to the total family should be taken into consideration while providing home-based training

programmes. Training of the parents to train the retarded children is promising to be an effective mode in reaching out to the large population of mentally retarded individuals, especially in a developing country like India where there is dearth of qualified special educators and special schools.

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## **Attitudinal Change: An Experimental Study**

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THE objectives of the present study were to verify whether the change in attitudes could be induced experimentally and how the different independent variables interacted with the attitudinal change with respect to the extent, durability and direction of change. The study was confined to 108 subjects in the age-group 8-9 years who were selected randomly from four different schools of Nagpur city. The necessary data were collected by means of questionnaires and observation-cum-performance tests. The persuasive communication, viz. audio-visual, audio and control were treated as experimental treatments. The experimental design adopted in this study was "before-after" type. A step-wise least squares technique for multifactor analysis of covariance was applied to test the significance of the main effects and interactions of treatment, school atmosphere and sex after controlling the effects of independent variables. The analysis of data led to the conclusion that it is possible to bring about a change in attitudes among the children in the age-group 8-9 through the methods which could be termed as persuasion.

**A**TTITUDES, the end products of the socialization process, significantly influence man's responses to cultural products, to other persons, and to groups of persons. The study of attitudes is the primary concern of teachers because their basic objective is modification of behaviour which is impossible unless they know how attitudes get crystallized, modified, changed, or altogether erased. The change of behaviour or attitude at the mass level is not only the concern of the teachers but also of psychologists, sociologists, politicians, economists, etc. The objective of the present study was to verify whether change in attitudes could be induced experimentally, and how different independent variables interacted with the attitudinal change with respect to the extent, durability and direction of change.

To achieve the above objectives, the study was conducted and the resultant data were analysed by the application of appropriate statistical techniques some of which are rather complicated for an average reader. But a general reader, particularly a teacher at the elementary and secondary school level who is basically interested in shaping the behaviours of children through changes in their attitudes might be interested in knowing the scope of manipulation of attitudinal change escaping the statistical intricacies and complications. Besides, a serious student of experimental education, a psychologist and a politician may be keen to know how the findings of the present study add to our knowledge of the theory of attitudinal change or at least how these findings could be assigned a place in the context of the basic theories of attitudinal change. Therefore, in the present paper, the investigator has described the methodology and findings of the experiment in brief and the general conclusions in detail. There are various types of attitudes, but for the present study attitudes towards cleanliness and work only were considered.

## METHODOLOGY

The research in theory pertaining to the nature and nurture of attitudes and measurement has been accumulating at a very fast rate. Thus, for the last 70 years or so the theoretical as well as empirical researches regarding attitudinal change have been amassing. The theories of attitudinal change which were developed by the different social scientists (Insko, 1967) inspired considerable experimental research in the study of attitudinal change.

Even though a number of studies have been conducted in advanced countries regarding attitudinal change (Fisher, 1968; Westervelt, Brantley and Ware, 1983; Field and Anderson, 1985; Tallichet and Willits, 1986, etc.) most of them were in controlled laboratory conditions on relatively small samples. There are very few studies which have been conducted in actual classroom situations. The paucity of research in attitudinal change in India is obvious. Researches by Bhutani, 1973, Kashyap, 1982, etc. are some of the elementary studies. Experimental research in

attitudinal change in India is rare, if not altogether non-starter. In view of such paucity of research, the investigators had to evolve methodologies with respect to various objectives of the study.

### *Sample*

The study was confined to 108 subjects in the age-group of 8-9 years who were selected randomly from four different schools run under four different managements.

### *Design of the Experiment*

The design used in this study was based on the following theoretical premise\*:

$$\text{Attitudinal change} \rightarrow f\{I_v \cdot Ex_v\} + C$$

where,

$I_v$  = Independent variables, viz. intelligence, social intelligence, academic performance and socio-economic status.

$Ex_v$  = Experimental treatments, viz. audio-visual (video-taped dramas related to cleanliness and work), audio (taped stories of the same dramas related to cleanliness and work) and control.

$C$  = Constant

### *Measurement of Independent and Dependent Variables*

#### *(a) Independent Variables*

- (i) *Intelligence*: After considering the various types of intelligence tests, the investigator selected the Srivastava and Saksena's test of intelligence.
- (ii) *Social Intelligence*: For the measurement of social intelligence, index of the teachers' rating on the five-point scale on seven dimensions already determined by Chadha and Ganesan (1986) was prepared.
- (iii) *Academic Performance*: The standard scores of the marks obtained by the subjects in their last annual examination were considered as the academic performance of the subjects.
- (iv) *Socio-economic Status*: Information regarding the SES of a subject was collected through the administration of a questionnaire, considering income, education, occupation and caste as the main constituents.

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\* The proposition is not given in algebraic equation form as the measurement of variables involved may not be examined and explained with mathematical precision.



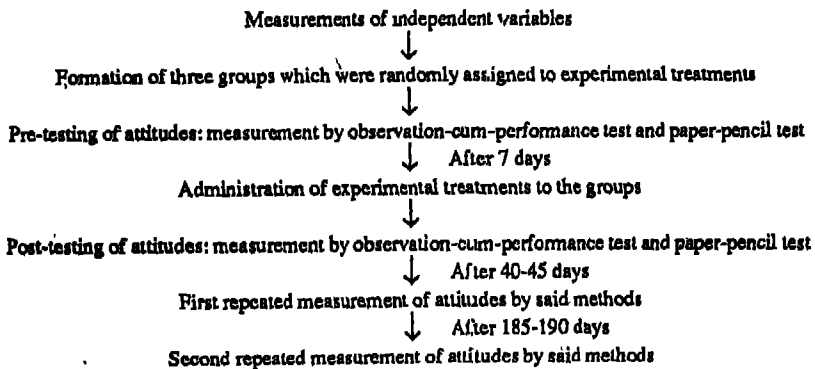
### **(b) Dependent Variables**

One of the shortcomings of the questionnaire measurement is that the subjects tend to project themselves in the desirable light. In order to overcome this shortcoming, observation-cum-performance test was considered as a supplementary technique for the measurement of attitudes.

- (i) *Construction of Attitudes Scales:* A scale for measurement of attitude towards cleanliness was constructed, adopting Thurstone's equal-appearing interval technique (Bharambe and Pandit, 1988). Applying the same technique, a scale of attitude towards work was constructed, having parallel form reliability of 0.68.
- (ii) *Preparation of Observation-cum-Performance Test:* For the measurement of attitudes towards cleanliness and work, situations and tasks were formulated after discussion with experts.

### **Procedure of Experimentation**

Experiments were carried out in four different schools with due consideration to the various controls to be exercised. An outline of the procedure with respect to attitudes towards cleanliness and work is given below:



### **Description about the Changes in Attitudes**

The procedure for the estimation of the changes in attitudes is given as under :

1. First change in attitudes = Post-test scores of measurement – pre-test scores of measurements
2. Second change in attitudes = First repeated test scores of measurements – pre-test scores of measurements
3. Third change in attitudes = Second repeated test scores of measurements – pre-test scores of measurements

### *Analysis of the Data*

As stated earlier, in the present paper the emphasis is on the general conclusions of the study. But without statistical analysis it is not possible to draw conclusions. Therefore, in the present paper only an outline of the results is given. The statistical technique used in this study for analysing the data was the step-wise least squares technique for multifactor analysis of covariance.

Though the experiment was started with an equal number of subjects for each treatment, at the end of the experiment, i.e. after second repeated measurement, the number of subjects for each treatment became unequal due to non-availability of the subjects during the experiment. Only 96 subjects were present at the end of the experiment. Harvey (1975) suggests least squares analysis by method of fitting constants to the data with unequal subclass frequencies which has been used in the present study.

### *Analysis of Covariance*

To test the significance of the main effects and interactions of treatment (A), school atmosphere (B) and sex (C) after controlling the effects of independent variables, pretest score of attitude towards cleanliness measured by the paper-pencil test (L), pretest score of attitude towards cleanliness measured by the observation-cum-performance test ( $L_1$ ), pretest score of attitude towards work measured by the paper-pencil test (P), pretest score of attitude towards work measured by the observation-cum-performance test ( $P_1$ ), intelligence (D), social intelligence (G), academic performance (H), socio-economic status (S) on dependent variables, analysis of covariance was applied. The dependent variables are pretest scores and changes in attitudes towards cleanliness and work.

As suggested by Evans and Anastasio (1968), all the independent variables were measured before the application of treatments. According to Solomon (1949), Hovland, Janis and Kelley (1953), and Nosanchuk and Marchak (1969), pretest score sensitizes the effect of treatments and hence the results are likely to be erroneous. So in the present study pretest scores were used as covariates. The variables/factors and their interactions which were not significant at least at 0.25 level were excluded while analysing the data. To see the effect of school atmosphere, treatment and sex, dummy variables were used.

In Tables 1 to 4, the signs "\*", "\*\*", "\*\*\*", and "\*\*\*\*" indicate that the main effects and interactions of the factors are significant at 0.01, 0.05, 0.10 and 0.25 level, respectively. The factors/interactions/variables which are significant at 0.10 and 0.25 level were not discussed as far as their effect on the dependent variables is concerned, so these were not discussed.

TABLE 1  
Observations Pertaining to Attitude towards Cleanliness  
(Measured by Paper-Pencil Test)

Stages of Experiment	SV	df	SS	F
Pretest Scores	S	1	0.45147	3.33***
	Error	94	12.746118	
First Change	L	1	10.81495	70.41*
	D	1	0.803614	5.23**
	S	1	0.258015	1.68****
	Error	92	14.1321	
Second Change	P	1	3.608626	7.15*
	S	1	5.571888	11.04*
	L	1	11.855473	23.49*
	P <sub>1</sub>	1	2.664832	5.28**
	Error	91	45.928	
Third Change	L	1	10.97519	25.97*
	S	1	0.894391	2.12****
	A	2	1.386325	1.64****
	Error	91	38.4522	

TABLE 2  
Observations Pertaining to Attitude towards Cleanliness  
(Measured by Observation-cum-Performance Test)

Stages of Experiment	SV	df	SS	F
Pretest Scores	D	1	104.6221	2.49****
	Error	94	3951.74	
First Change	B	3	81.4692	4.00**
	L <sub>1</sub>	1	17.8800	2.63****
	B × C	3	70.4190	3.46**
	A × B	6	65.8157	1.62****
	A	2	102.3987	7.54*
	Error	80	542.943	
Second Change	B	3	115.4341	23.31*
	A × B	6	37.8380	3.82*
	L <sub>1</sub>	1	3179.032	1925.89*
	B × C	3	12.5467	2.53***
	Error	82	135.3557	
Third Change	B	3	651.5781	115.2817*
	L <sub>1</sub>	1	3654.297	1939.63*
	Error	91	171.4456	

**TABLE 3**  
**Observations Pertaining to Attitude towards Work**  
**(Measured by Paper-Pencil Test)**

Stages of Experiment	SV	df	SS	F
Pretest Scores	B	3	2.6895	2.79**
	D	1	0.9306	2.90***
	G	1	1.0380	3.24***
	B × C	3	1.9498	2.03***
	Error	87	27.8970	
First Change	B	3	2.0502	3.39**
	A	2	1.4147	3.52**
	L <sub>1</sub>	1	1.1707	5.81**
	P	1	18.2435	90.66*
	A × B	6	2.1439	1.77****
	B × C	3	1.3135	2.17***
	A × C	2	0.9203	2.29****
	A × B × C	6	1.6637	1.38****
Second Change	Error	71	14.2867	
	P	1	14.2058	34.84*
	S	1	3.3533	8.22*
Third Change	Error	93	37.924	
	P	1	24.7551	88.93*
	S	1	1.0551	3.79***
	D	1	0.8275	2.97***
	G	1	1.6960	6.09*
	Error	91	25.3304	

## DISCUSSION

The results of this study indicate that the influence of treatments, sex and school atmospheres, and their interactions are not reflected on the pretest score and change scores of the attitude towards cleanliness measured by the paper-pencil test.

The effect of school atmospheres and sex is not noticeable in the pre-experimental stage whereas the influence of school atmospheres was found in the changes of attitude towards cleanliness measured by the observation-cum-performance test.

TABLE 4  
Observations Pertaining to Attitude towards Work  
(Measured by Observation-cum-Performance Test)

Stages of Experiment	SV	df	SS	F
Pretest Scores	B	3	826.8	4.62*
	C	1	210.2	3.52***
	Error	91	5426.8	
First Change	B	3	868.7731	11.63*
	A $\times$ B $\times$ C	6	393.080	2.63**
	B $\times$ C	3	317.0431	4.24**
	P <sub>1</sub>	1	1401.543	56.3*
	A $\times$ B	6	261.9125	1.75****
	Error	76	1891.668	
Second Change	P <sub>1</sub>	1	1712.025	8.25*
	L	1	766.4020	3.69***
	A	2	850.2141	2.05****
	D	1	328.3332	1.58****
	A $\times$ B	6	2981.40	2.39**
	Error	84	17437.96	
Third Change	P <sub>1</sub>	1	3160.125	54.45*
	L <sub>1</sub>	1	249.17	4.29**
	G	1	238.228	4.10**
	P	1	451.161	7.77*
	S	1	111.749	1.92****
	Error	90	5223.63	

The significant difference in the first attitude change score is observed due to different treatments so far as attitude towards cleanliness measured by the observation-cum-performance test is concerned. The significant interactions between school atmosphere and sex, and treatment and school atmosphere are observed on the first and second change of attitude towards cleanliness measured by the observation-cum-performance test.

The influence of school atmosphere in the pre-experimental stage and first change is observed on attitude towards work both measured by the paper-pencil test and the observation-cum-performance test.

The experimental treatments show their influence on the first change score of attitude towards work measured by the paper-pencil test.

The significant interactions among the school atmosphere, sex and treatment, and between the school atmosphere and sex are explained on the first change

whereas the significant interaction between treatment and school atmosphere is found on the second change of attitude towards work measured by the observation-cum-performance test.

The influence of some of the covariates is reflected in the results inspite of controlling their effects on the dependent variables.

## GENERAL CONCLUSIONS AND THEORETICAL IMPLICATIONS

### *Conclusions Regarding Attitudinal Change with Respect to the Different Variables Studied in the Present Project*

1. The first conclusion that is promoted by the present project is that it is possible to bring about a change in attitudes among the children in the age-group of 8-9 through the method which could be identified as persuasion.

Presuming that it is not possible to change the attitude unless changes are brought about in the basic structure of personality at different levels of consciousness and functioning of the various aspects of personality and interactions thereof, it can be concluded by corollary that it is possible to bring about such changes through the said method characterised by different degrees of permanence.

2. So far as the pre-experimental status of a given attitude is concerned, it goes a long way to determine the magnitude of change subsequent to experimental manipulations. If this statement is true, its converse is equally true. In order to be more precise, if the pre-experimental status of an attitude is positive it is possible to bring about the change in proportion to the pre-experimental status depending on how we define attitudinal change with reference to the duration of the change as well as the time taken to bring about the change. Conversely, if the pre-experimental status of an attitude is negative, it is possible to make it more negative through experimental manipulations, and the experimenter may need greater time and efforts to bring about the change in a positive direction.

3. Since attitudes are acquired, the social-psychological field in Lewinian terms is probably the most important factor in the emergence of an attitude as well as bringing about attitudinal change. That is probably why the school has emerged as the most significant parameter in the present experiment.

4. The cognition of the desirability of an attitude on the part of an individual is the basic requirement but that does not guarantee attitudinal change in the desirable direction. In the present study intelligence has not shown any consistent association with attitudinal change. This means that at knowledge level the children might know the significance of attitudes towards cleanliness and work but that does not mean that attitudes are bound to be modified. Attitude is essentially a personality character falling within the affective domain, and knowledge belongs

to the cognitive domain. Theoretically when we consider the emergence of functional autonomy of motives it is recognised to be the product of interaction between the conative, cognitive and affective domains of personality. Functional autonomy is inclined towards value orientation and internalisation of cognitive comprehended values. Thus, unless an attitude becomes a part of the affective domain as such it is not going to be functionally autonomous.

5. Sex is irrelevant to attitudinal change despite the fact that there are sharp sex differentials in the adult roles in Indian society. Boys and girls are equally amenable or indifferent to attitudinal change. The sex differentials in the said change disappear as soon as the social context to which the individuals are exposed become uniform for both the sexes.

6. So far as the durability of change is concerned it needs to be noted that there is very possibility of relapse into the original status of the attitudes. This implies that the effect of persuasion is only peripheral. In order to make the impact of persuasion deeper into the psyche of the individual, persuasion has probably to be varied in medium and deeper in effect. Besides, the greater frequency of persuasion may be more effective in terms of durability of the change.

All the principles of classical conditioning seem to be operative in attitudinal change. Acquired attitudes become deconditioned with the passage of time as it was found while measuring the attitudinal change subsequent to experimental manipulation.

7. Even though no reinforcement was given to bring about conditioning of the attitudes among the subjects of the study, yet the investigator feels that there can be a very strong link between the initial attitudinal changes and the quantity of reinforcement provided. However, once the attitudes are acquired to the degree of aforesaid functional autonomy no reinforcement may be essential.

#### *Implications for General Theories of Attitudinal Changes*

1. The studies explaining attitudinal changes have been divided into 12 different broad theories. The most relevant theories, considering the objectives of the present study, are (i) Rokeach's Belief Congruence theory, (ii) Rosenberg and Abelson's Affective-Cognitive Consistency theory, and (iii) McGuire's Inoculation theory.

Rokeach (1975) has concluded that any stimulus such as a verbal concept or event will tend to activate within the individual that portion of his belief system which is relevant to the stimulus. The conclusion drawn by Rokeach has relevance to the findings of the present project. Applying the theme of belief congruence theory to the problem of attitudinal change as considered in the present project, it can be concluded that experimental manipulation of attitudinal change serves as a stimulus which activates the beliefs of the subjects so much so that the stimulus

and the belief become congruent. Thus, whatever beliefs the subjects have about the attitudes under discussion those are supposed to have been stimulated by persuasion.

Rosenberg and Abelson (1960) have propounded the affective-cognitive-consistency theory explaining the crystallization of attitudes. Discussing the attitude structure, Rosenberg and Abelson (1960) maintain that attitudes possess psychological structure. By structure, the authors mean a system of relationships that exist among various events that an individual organism has experienced. Starting from this basic position the authors prove the relationship between the cognitive and affective components of personality. The change in attitudes is brought about by change in one of the components of the personality; if there is a change in the cognitive component, it is bound to bring about a change in the affective component. Even though the authors have not talked about the speed and intensity of change, yet analysing their theory further one can draw the conclusions relevant to the process and product of change in terms of the speed, time intensity and durability of the change. Mention has already been made about the possibility of attitude change as a result of the change in the basic structure and dynamics of personality (pp. 14-15). These observations are absolutely in congruence with what Rosenberg and Abelson have concluded in their theory.

So far as durability of change and internalisation of attitude as a value is concerned, it has been dealt with by different attitude theorists. McGuire's (1964) theory, known as inoculation theory, is prominent in such theories, even though McGuire borrowed the concept underlying the theory from biological sciences.

Summing up McGuire's inoculation theory, it can be stated that individuals can be held in an immunized state against any possibility of negative influences on their attitudes. Immunity in biological sciences, as is well known, can be brought about by appropriate inoculation or vaccine. Besides, the system can be protected from the affliction of a disease by removing the disease-generating organisms and the situations from the field in which the organisms have to be kept disease-free. The fight against cholera could serve as a classical example of the immunization or inoculation theory. Coming to the problem of attitudinal change and maintaining the positively changed status of the attitudes, we can utilize two alternatives implicit in McGuire's inoculation theory :

- (i) Keeping the subjects inoculated against any adverse effects on their attitudes;
- (ii) Removing those elements from the social-psychological field which run counter to the formation and maintenance of the required attitudes.

Regarding the process of inoculation as a step in immunization we could conceive intensive and all-pervading persuasion which may even rise up to the level of brain-washing through suggestion and other mechanisms. Thus, attitude may become an integral part of personality so much so that it becomes functionally



autonomous resisting attack from any external forces. So far as removing the sources of virus is concerned, we can draw an analogy pertaining to the present problem, i.e. whatever conditions are there which generate forces counter to the attitudes under discussion, they need to be cleared off.

It is clear from these details that McGuire's inoculation theory contains the basic principles of the conditioning theory of learning. Individuals stimulated to be conditioned to one particular type of behaviour over a period of time are bound to manifest the required behaviour for quite a space of time, depending on the strength of the conditioned responses.

2. Attitudinal changes have been the concern of Governments all over the world. In the twentieth century we have examples when some people with strong political ambitions wanted to bring about change in the basic personality structure of the citizens through changes in their beliefs and attitudes. The approach adopted by Adolf Hitler preceding the Second World War is only too well known to deserve any detailed discussion. The famous dictum of Hitler is, "a lie repeated 100 times becomes the truth". Similarly, fascism in the pre-Second World War Italy is another example how the parties in power utilise the mass media to bring about changes in the attitudes of masses. The truth contained in McGuire's inoculation theory is indicated in the totalitarian states where the rulers want their citizens to believe in certain principles and behave accordingly, with almost complete immunity against counter-forces. The universally recognised iron curtains behind which people were forced to exist in some totalitarian systems served as a protective wall against any possibility of change in the attitudes desired by the state power. The fact that Perestroika, Glasnost, Tienanmen square are being talked about proves how state power controls the beliefs and attitudes of the masses. The examples quoted above are only a sample of the events which are taking place all over the world concerning the control and change of attitudes. But this is not to deny the fact that democratic forms of Government or systems based on religious fundamentalism also take care of attitudinal change and control. The capitalistic system is also based on attitudinal change.

The means utilized to bring about change in attitudes and control of attitudes and beliefs at the mass level in almost all political systems are more or less the same: persuasion through utilisation of mass media. The states do not hesitate to utilise extreme measures to bring about brain-washing of the masses or create mass hysteria. War-time propaganda is an example to prove the point.

3. There is no doubt that 100 per cent success in bringing about change in the attitudes at mass level is not free from danger because that contains the possibility of utilizing human beings as guinea pigs and robots. However, attitudinal change and manipulation thereof, if restricted to certain behaviours permissible under some universal values, contains tremendous scope for human welfare.

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## **Rorschach Vignette of Effective and Ineffective Teachers' Personality**

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IDENTIFICATION of a set of specific qualities and characteristics of an effective teacher would, on the one hand, help in the selection of competent teachers and, on the other, help to eliminate inefficient and ineffective teachers. Prediction of teaching success cannot be attempted without visualizing clearly the qualities involved. And, surely enough, knowledge of the qualities of efficient teachers can be of real help in distinguishing the profession of teaching from others.

“A TEACHER affects eternity; he can never tell where his influence stops”. So observed the historian philosopher, Henry Adams.

For many teachers this is earnestly to be hoped; with regard to others it is a despairing thought. It seems reasonable to assume that good teachers—those who are skillful in developing understanding of the world in which man lives, insightful with respect to the ways and means of stimulating intellectual appetites, and capable of patience, understanding and sincere feelings for others—may pave the way for an enlightened and productive society. Poor teaching, on the other hand, would seem to be a significant contributor of its unfortunate share to the perpetuation of ignorance, misunderstanding, and intellectual and cultural stagnation.

In a developing country like India where the pace of development has to be accelerated, the task of reconstruction of human mind and development of human potential has added importance. A teacher who is conscious of the national goals, is imbued with high ideals and human values, and is able to communicate effectively can alone shoulder the responsibility of the new generation entering the 21st century. Who is this teacher? What is he made up of?

## OBJECTIVES

The present study was conducted with the following objectives in view :

1. To determine and compare the personality trait of effective and ineffective teachers on Eighteen Rorschach Personality Traits as propounded by Carstairs, Payne and Whittaker (1960).
2. To analyse the Rorschach components and draw psychograms to depict the personality structure of effective and ineffective teachers.

## SAMPLE

The primary sample consisted of 200 teachers (male and female) from various schools of Agra city. The final sample included effective and ineffective teachers as indicated in Table 1.

## TOOLS AND TECHNIQUES

The main tool of the study was the Rorschach Ink-Blot Test. But for subsidiary purposes, the following tools were also used :

1. The Teacher Effectiveness Scale developed and standardized by Mutha and Kumar (1974). It was used for the final selection of the sample, i.e. effective and ineffective teachers (male and female).

# RORSCHACH VIGNETTE OF EFFECTIVE AND INEFFECTIVE TEACHERS

TABLE 1  
Institution-wise Distribution of Sample (Male and Female Teachers)

S. No.	Name of Institution	No. of Cases	
		Effective Teachers	Ineffective Teachers
1.	R.E.I. Inter College, Agra	2	3
2.	L.B. Inter College, Agra	7	1
3.	Soami, Bagh Inter College, Agra	1	3
4.	R.S.S. Girls' Inter College, Agra	4	5
5.	Chandravati Balika Vidyalaya, Agra	2	—
6.	S.V.M. Inter College, Agra	—	1
7.	Vidya Bharati H.S., Agra	—	2
8.	Anglo-Bengali Girls' Inter College, Agra	—	1
Total		16	16

2. Information Schedule constructed by the investigator (Vashistha and Sharma, 1984) to observe the cases under Rorschach investigation and to collect the required information for interpretation of the Rorschach protocols.

## PROCEDURE

First of all the Teacher Effectiveness Scale was administered to select the final sample. The purpose of the scale was frankly explained and it was emphasized that no item should be omitted and there was nothing "right" or "wrong" about the questions. The scale consisted of 69 items on five-point scale. The total score varied from 69 to  $69 \times 5 (= 345)$  representing least effectiveness to highest effectiveness of a teacher. The teachers who fulfilled the criteria of effective teacher (329.91) and ineffective teacher (250.00) were selected for further Rorschach testing. Thus the researcher included the extreme groups on the Teacher Effectiveness Scale and all other middle and average groups were dropped from the study.

The selected teachers were then administered the Rorschach Ink-Blot Test (RIBT) in their respective colleges, on the date and time fixed up by them. The teachers were requested to cooperate and answer the questions on the Information Schedule truthfully.

After the testing was over the Rorschach protocols of each subject were scored. The Klopfers et al. (1956) system of scoring was adopted by the investigator for scoring as well as interpretation.

TABLE 2 Showing Difference between Effective and Ineffective Teachers				
S. No.	Personality Trait	Rorschach Criteria	Chi-square Value	Remark
1	2	3	4	5
1.	*Emotional construction	— F-per cent — M — 2 sum C	10.59* 2.00 0.04	Effective Teachers are outstandingly superior on the trait — emotional construction
2.	Abundance of creative impulses	— High M	2.00	No difference between effective and ineffective teachers
3.	*Marked inhibition of sexuality	— Low FM* — Sex-R	6.82* 0.08	Effective teachers possess marked inhibition of sexuality
4.	*Dependency	— High FM* — M — cF	6.82* 2.00 0.15	Effective teachers possess more emotional dependency
5.	High degree of empathy	— Fe	0.50	No difference exists between effective and ineffective teachers
6.	Abhorrence of dirt	— A-per cent	0.13	No difference exists between the groups
7.	Inhibition of emotional expression	— Sum C — C	0.04 0.55	No difference exists between effective and ineffective teachers
8.	Relish for sensual experience	— cF	0.15	No difference exists between the groups, i.e. effective and ineffective teachers
9.	**Difficulty in establishing close personal relationship	— FC**	4.73**	Ineffective teachers feel more difficulty in establishing close personal relationship
10.	More interested in practical concerns than theorising	— D-per cent — Low-W	0.13 0.13	No difference exists between the two groups on the trait
11.	Attempt at strong ego-formation, ego-defense crumbling	— F-per cent	0.00	F-responses do not occur in the groups, i.e. effective and ineffective teachers
12.	Level of general anxiety	— K — KF — kF	0.90 1.07 0.82	No difference exists between the groups on this trait
13.	Paranoid: pre-occupied with threatening fantasies	— Abstract — M	2.03 2.00	No difference exists on this negative personality trait
14.	Anxiety concerning bodily functions	— At — AAt	1.70 0.53	No difference exists in relation to this trait
15.	**Given introspection	— FK**	4.51**	Effective teachers introspect more carefully and accurately

## RORSCHACH VIGNETTE OF EFFECTIVE AND INEFFECTIVE TEACHERS

1	2	3	4	5
16.	Reality testing, defective	— F-per cent	0.00	No F-response is given by the groups
17.	Inhibition of aggression	— de — dd — di	0.60 0.00 1.12	No difference exists between the groups
18.	Awe of father-figure	— (II) — (IId)	0.04 0.14	No difference exists between the groups
* (single asterisk) indicates Rorschach criteria significant at 0.01 level				
** (double asterisk) indicates Rorschach criteria significant at 0.05 level				
df = 1				

### PERSONALITY DIFFERENCES BETWEEN EFFECTIVE AND INEFFECTIVE TEACHERS: A STATISTICAL ANALYSIS

To achieve the first objective of the study, the investigator categorised the Rorschach Responses into eighteen Personality Traits (based on the Criteria of Carstairs, Payne and Whittaker, 1960). The mean, median and percentages for various Rorschach components were computed. To analyse the difference between the two groups (effective and ineffective teachers), Median Test was applied. The calculated chi-square values are summarised in Table 2 with  $df = 1$  and corresponding level of significance.

#### SIGNIFICANT PERSONALITY TRAITS

##### *Trait 1: Emotional Construction*

Table 2 reveals that the chi-square value on F-per cent is found significant at 0.01 level, while the chi-square values on the Rorschach criteria M and 2 Sum C show no significant difference between the effective and ineffective teachers. On the basis of F-per cent, it can be interpreted that effective teachers (ET) are superior in relation to emotional construction.

It is also supported by Table 3 where in the case of ineffective teachers (IT) the M, 2 Sum C and F-per cent are 1.37, 0.72 and 48.42, respectively, which denote that ineffective teachers possess low level of emotional construction (control or adjustment) achieved by withdrawal and repression with too little energy remaining in emotional contact with social environment (Klopfer, 1956, Vashistha, 1982).

### *Trait 3: Marked Inhibition of Sexuality*

The chi-square value on the Rorschach Criterion Low FM is found significant at 0.01 level. It partially denotes that effective teachers (ET) are having marked inhibition of sexuality as their personality trait, while ineffective teachers are ruled by the immediate needs of gratification who tend to act on impulse without inhibition. It reflects childish impulsive behaviour and pleasure-principle prevails in their action ( $FM > 2M$ ;  $1.43 > 4.03$ ) (Klopfer et al. 1956, pp. 289).

### *Trait 4: Dependency*

The trait dependency is represented by the Rorschach Criterion high FM, M and CF. The calculated chi-square values for these Rorschach criteria are 6.821, 2.00 and 0.15, respectively, out of which the chi-square value for high FM is found significant at 0.01 level. It indicates that effective teachers (ET) are having dependent personality characteristics. Although the remaining two Rorschach Criteria have shown no significance at any level but the detailed analysis also confirms the availability of the trait in effective teachers as the high number of cases (10, 10) are piling up in the above median column.

It is also verified by Klopfer et al. (1956), Kundu (1980) that the high FM alone represents the characteristics of overtly helpless, sycophant and presumably indicate dependency needs (Klopfer pp. 265).

### *Trait 9: Difficulty in Establishing Close Personal Relationship*

This trait comprises of the Rorschach Criterion FC which denotes clear-cut significant difference between effective and ineffective teachers. The chi-square value (4.73) on the Rorschach Criterion FC confirms that ineffective teachers have difficulty in establishing close personal relationship.

It is also confirmed from Table 3 where  $FC = 0.96$  also suggests that the person is unable to make a pleasant, gracious and charming response to a social situation and to get along smoothly with other people (Klopfer et al. 1956, pp. 279). It also gives confirmatory test to the personality trait emotional construction.

### *Trait 15: Given Introspection*

The personality trait Given Introspection consists of the Rorschach criterion FK, which clearly indicates the difference between effective and ineffective teachers (ET and IT). The calculated chi-square value (4.51) is found significant at 0.05 level. It reveals that ineffective teachers have a poor type of introspection of their inner resources and potential in relation to their counterparts.



## RORSCHACH VIGNETTE OF EFFECTIVE AND INEFFECTIVE TEACHERS

It also suggests a poor number of FK responses (0.422) in the case of ineffective teachers. Ineffective teachers are unable to handle their affectional anxiety by introspective efforts, by an attempt to objectify their problems by giving perspective on them (Klopfer et al. 1956, pp. 268).

### NON-SIGNIFICANT PERSONALITY TRAITS

The personality trait Nos. 2, 5, 6, 7, 8, 10, 11, 12, 13, 14, 16, 17, 18 have shown no significant difference on the corresponding personality traits. It can be interpreted that there is no significant difference between effective and ineffective teachers in relation to the following personality traits: Abundance of creative impulses; High degree of empathy; Abhorrence of dirt; Inhibition of emotional expression; Relish for sensual experience; More interested in practical concerns than theorising; Attempt at strong ego-formation, ego-defense crumbling; Level of general anxiety; Paranoid—pre-occupied with threatening tendencies; Anxiety concerning bodily functions; Reality testing defective; Inhibition of aggression. It can be said that on most of these personality traits both the groups are homogeneous in nature or it may be possible that some peculiar traits concerned with anxiety of general nature or of bodily functions, empathy, inhibition of aggression are neutralised by their sex amalgamation in the sample of effective and ineffective teachers as these personality traits have positive tendency in effective female teachers (Vashistha and Sharma, 1984). The personality trait Nos. 11 and 13, i.e. Attempt at strong ego-formation, ego-defense crumbling; and paranoid—pre-occupied with threatening fantasies are related with negative personality and show abnormal trends of personality. As the sample under study was concerned with effective and ineffective teachers from various institutions of Agra city, they are normal in nature and their reality testing is not defective which is represented by F-per cent or abstract responses on the Rorschach Cards.

After summarising the results as given in Tables 2 and 3, it can be inferred that effective and ineffective teachers (E and IT) have sharp distinction in relation to the following personality traits :

- Trait 1. Emotional construction
- Trait 3. Marked inhibition of sexuality
- Trait 4. Dependency
- Trait 9. Difficulty in establishing close personal relationship
- Trait 15. Given introspection

Out of the above personality traits, effective teachers are found superior on Traits 1, 3 and 4 while ineffective teachers have high level of difficulty in establishing close relationship and in giving introspection, i.e. personality trait Nos. 9 and 15.

**TABLE 3**  
**Rorschach Components and Quantitative Relationship**

Rorschach Components and their Relationship	Effective Teachers	Ineffective Teachers
R	457	368
W%	29.06	32.33
D%	46.35	50.07
d%	6.83	8.52
(Dd + S)%	10.85	7.69
M	01.93	01.375
A%	44.23	39.82
W% : M	5.5 : 1.93	5.625 : 1.37
M : FM	2.03 : 7.18	1.53 : 4.03
M : FM + m	2.03 : 8.09	1.53 : 5.18
Sum C	1.93	0.36
FC : CF + C	34.5 : 1.5	0.96 : 0.78
FC + C + C' : FC + CF + C	4.28 : 2.65	2.93 : 1.96
F%	27.71	48.42
FK + F + FC%	52.07	57.44
F/FK + FC	1.18	0.422
M : Sum C	01.93 : 1.93	1.375 : 1.156
FM + m : FC + C + C'	7.93 : 3.06	4.25 : 2.125
Percentage of R to Cards:		
VIII, IX and X	36.09	36.88
H + A : Hd + Ad	13.37 : 1.56	10.18 : 1.62

#### EFFECTIVE AND INEFFECTIVE TEACHERS : A COMPARATIVE PERSONALITY STRUCTURE

As the statistical analyses give no significant difference on most of the personality traits, here on psychograms of both the group, i.e. effective and ineffective teachers, the investigators have not found major quantitative differences by analysing the Rorschach indices and their interrelationships and proportions (Table 3). A few prominent differences which show peculiar personalities of the groups are mentioned here.

Effective teachers possess introversive type of personality while ineffective teachers have ambivert type of personality. Ineffective teachers are ruled by immediate needs for gratification rather than by long-range goals (F%, M and

Sum C). The two groups similarly utilize their inner resources for constructive solution of the everyday problems of their life (M and FM).

The proportions relating to the Organisation of Affectional Need (F : FK + FC) differentiate the two groups. In ineffective teachers the need for affection has developed sufficiently well and is integrated well enough with the rest of the personality organisation, while in the case of ineffective teachers the need for affection shows denial, repression and its underdevelopment which might stem from rejection experiences (Klopfer et al. pp. 292).

Further, it is confirmed by the ratio of achromatic and chromatic responses. While effective teachers possess capability of proper interaction with social environment, ineffective teachers' responsiveness to environment has been interfered by traumatic experiences and withdrawal results.

It will be clear from these interpretations that there is homogeneity between the two groups on the traits related with the cognitive domain like intelligence, intellectual manner of approach, organizational interest with creative potential, critical attitude, common sense application of intelligence and high level of aspiration.

While both the groups possess remarkable differences on the personality traits related with the affective domain, it is clear that in the case of ineffective teachers there seems to be an overriding intellectual ambition without the ability to back it up (W% 30%). This shows that these teachers lack intellectual capacity and have emotional interferences with their abilities.

Finally, it can be concluded that ineffective teachers are threatened by emotional impact from environment. They apply defence mechanism to cope with these disturbances, like—denial, repression, withdrawal, etc. The need of affection is unduly developed and it leads to anxieties and maladjustment with the immediate environment. They are unable to utilize their inner resources for constructive solution of everyday problems of their life. They possess, generally, vulnerable overdependency on responses from others.

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## Ph.D. Theses Abstracts

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### *Personality Adjustment, Mental Health and Saora Acculturation: A Cross-cultural Study*

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SINCE the development of anthropology as a science and especially its link with psychology, psycho-analysis and allied disciplines of social sciences, constant efforts have been made by academic and professional anthropologists and psychologists to empirically test the effects of culture change on the personality adjustment and mental health structure of different primitive societies due to acculturation and culture contact with the Western civilisation. The well-designed studies conducted in different primitive societies in and outside India have expanded the scope of our knowledge about this subject. Important among the influential writings are those of Spair (1934 and 1937), Benedict (1934<sup>a</sup>, 1934<sup>b</sup> and 1938), Mead (1928, 1935 and 1937), Roheim (1950), Kluckhohn and Murray (1953) in the Western country and in Indian situation pioneering work of Ray (1955, 1957<sup>a</sup>, 1957<sup>b</sup>, 1959, 1965, 1975 and 1977), Aiyappans (1944), Fuerer-Haimendorof (1945), Majumdar (1950), Sinha (1956), Srivastava (1958), Singh (1975), Mahanta (1979) and Panda (1984) are noteworthy.

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Thesis submitted to Kurukshetra University (1986).

But, the Saora tribe, one of the primitive tribes in India and one of the important tribes of Orissa has received scanty attention from the Indian researchers. Except few articles on their cultural and social background, i.e. Munro (1930), Ramamurti (1931), Bell (1945), Elwin (1955), Thurston (1975), Mahapatra (1975), Patnaik (1980) and Panda (1984) no study has been conducted on their personality adjustment and mental health and its changes due to culture contact. In addition to that, the studies conducted by the Indian researchers need further investigation in different primitive societies to reach any generalisation. So all these factors led the investigator to undertake the present problem for investigation.

### OBJECTIVES

The following objectives were formulated for the study :

1. To find out the independent and interactive effects of acculturation and sex on personality adjustment of Saora and Oriya children.
2. To study the independent and interactive effects of acculturation and sex on the mental health of Saora and Oriya children.
3. To determine difference in attitude towards culture change between least accultured and more accultured Saora boys and girls and Oriya boys and girls.

### METHODOLOGY

#### *Sample*

The sample was confined to the state of Orissa. The final sample of the present study consisted of 290 students, i.e. 90 LA students from LA area (60 boys and 30 girls), 80 MA students from MA area (55 boys and 25 girls) and 120 Oriya students from both the areas, i.e. (80 boys and 40 girls) were chosen on the basis of the random sampling technique.

#### *Tools*

The following tools were used for the collection of data in the present investigation :

- Adjustment Inventory by Reddy (1964)
- Maudsley Personality Inventory by Eysenck (1964)
- Psychoticism Scale by Eysenck and Eysenck (1968)
- State Trait Anxiety Scale by Spielberger, et al (1973)
- Frustration Test by Chauhan and Tiwari (1972)

- Inferiority Scale by Pati (1972)
- Insecurity Scale by Pati (1972)
- Attitude Towards Culture Change Scale by Mahanta (1979)
- Non-directive Interview Schedule and Participant Observation Schedule developed by the investigator to differentiate between LA and MA areas. In addition to that, all the above tests were translated into Oriya and reliability and validity were also calculated.

### *Statistical Techniques Used*

In the present investigation, for the analysis of data, the techniques of Anova and 't' test were used.

### *Research Findings*

The main findings of the study are given below :

#### *1. Acculturation Differences in Personality Adjustment and Mental Health among LA, MA and Oriya Students*

(i) Table 1 reveals that Oriya and ORG groups possess better personal adjustment than LA and LAG; MAB possess better personal adjustment than LAB and there does not exist any significant difference between all other group combinations.

(ii) Oriya, ORG and ORG groups possess better social adjustment than LA, LAB, LAG, MAB and MAG groups and there does not exist any significant difference between all other group combinations.

(iii) Oriya, ORB and ORG groups possess higher total adjustment than LA, LAB, LAG and MAG groups; and MAB groups have better total adjustment than LAB groups; and there does not exist any significant difference between all other group combinations.

(iv) LA, LAB and LAG groups possess more psychoticism than MA, ORI, MAB, ORG and MAG groups; and MA, MAB and MAG possess more psychoticism than ORI, ORB and ORG groups and there does not exist any significant difference between all other group combinations.

(v) Concerning neuroticism, LA, LAB and LAG groups score significantly higher than ORI, ORB and ORG groups; and MA and MAB groups possess more neuroticism than ORI and ORB groups; and there does not exist any significant difference between all other group combinations.

(vi) More extroversion is possessed by ORI, ORB and ORG groups than LA, LAB, LAG and MAG students; and MA, MAB and MAG students possess more extroversion than LA, LAB and LAG students; and there does not exist any significant difference between all other group combinations.

TABLE 1  
Acculturation Difference in Personality Adjustment and Mental Health among LA, MA and Oriya Students

Acculturation Index since its secondary registration was started										
S. No.	Variables	LA* MA**	LA* ORI***	MA** ORI***	LAB* MAB**	LAB* ORB***	MAB** ORB***	LAG* MAG**	LAG* ORG***	MAG** ORG***
1.	Personal Adjustment	—	***	—	**	—	—	—	***	—
2.	Social Adjustment	—	***	—	—	***	***	—	***	***
3.	Total Adjustment	—	***	—	**	***	—	—	***	***
4.	Psychoticism	*	*	**	*	*	**	*	—	**
5.	Neuroticism	—	*	**	—	*	**	*	*	—
6.	Extroversion	**	***	—	**	***	—	**	***	***
7.	Inferiority	*	*	—	*	*	—	—	—	—
8.	Insecurity	*	—	—	*	—	***	—	—	—
9.	Regression	**	—	—	—	—	—	**	—	—
10.	Fixation	*	*	—	*	*	—	—	—	—
11.	Resignation	**	***	—	**	***	—	—	***	***
12.	Aggression	**	—	**	**	—	**	—	—	—
13.	State-anxiety	—	*	**	—	*	**	—	—	—
14.	Trait-anxiety	—	—	—	—	—	—	—	—	—
15.	Attitude towards Culture Change	**	***	***	**	***	—	—	***	***
		LA = Least Acculturated LAB = Least Acculturated Boys LAG = Least Acculturated Girls * = Least Acculturated			MA = More Acculturated MAB = More Acculturated Boys MAG = More Acculturated Girls ** = More Acculturated			ORI = Oriya ORB = Oriya Boys ORG = Oriya Girls *** = Oriya Students		



(vii) LA and LAB students expressed more inferiority feelings than MA, MAB, ORI and ORB students; and there does not exist any significant difference between all other group combinations.

(viii) Regarding insecurity, ORB possess more of this trait than MAB groups; and LA and LAB groups have a feeling of more insecurity than MA and MAB groups; and there does not exist any significant difference between other group combinations.

(ix) MA and MAG groups possess more regression in frustration than LA and LAG groups; and there does not exist any significant difference between all other group combinations.

(x) LA and LAB group possess more fixation in frustration than MA, ORI, MAB and ORG groups; and there does not exist any significant difference between all other group combinations.

(xi) ORI, ORB and ORG group possess more resignation in frustration than LA, LAB, LAG and MAG groups; and MA and MAB possess more resignation in frustration than LA and LAB groups and there does not exist any significant difference between all other group combinations.

(xii) MA and MAB possess more aggression than LA, ORI, LAB and ORG groups; and there does not exist any significant difference between all other group combinations.

(xiii) MA and MAB possess more state-anxiety than ORI and ORG groups; and LA and LAB possess more state-anxiety than ORI and ORB group; and there does not exist any significant difference between all other group combinations.

(xiv) There does not exist any significant difference between all the group combinations in relation to trait anxiety.

(xv) ORI, ORB and ORG groups possess increased attitude towards culture change than LA, MA, LAB, LAG and MAG groups; and MA and MAB groups possess increased attitude towards culture change than LA and LAB groups; and there does not exist any significant difference between all other group combinations.

## *2. Sex Difference in the Personality Adjustment and Mental Health among LA, MA and Oriya Students*

(i) Table 2 reveals that ORG possess better personal adjustment than ORB and LAB groups; and there does not exist any significant difference between all other group combinations.

(ii) ORG possess better social adjustment than ORB, LAB and MAB groups, and MAG possess better social adjustment than MAB groups; and LAG possess better social adjustment than MAB groups; and there does not exist any significant difference between all other group combinations.

TABLE 2  
Sex Difference in Personality Adjustment and Mental Health among LA, MA and Oriya Students

S. No.	Variables	Boys**	LAB* LAG**	MAB* MAG**	ORB* ORG**	LAB* MAG**	LAB* ORG**	MAB* LAG**	MAB* ORG**	ORB* MAG**	ORB* LAG**
1.	Personal Adjustment	**	—	—	**	—	**	—	—	—	—
2.	Social Adjustment	—	—	**	**	—	**	**	**	—	—
3.	Total Adjustment	**	—	—	**	—	**	—	**	—	—
4.	Psychoticism	*	—	—	*	*	*	**	*	*	*
5.	Neuroticism	**	**	—	**	—	—	—	*	—	**
6.	Extroversion	**	*	—	**	—	—	—	*	—	**
7.	Inferiority	*	*	—	—	*	*	—	—	—	—
8.	Insecurity	*	*	—	*	*	*	—	—	*	—
9.	Regression	—	—	—	—	—	—	—	—	—	—
10.	Fixation	—	—	—	—	*	—	**	**	—	**
11.	Resignation	—	—	—	—	—	—	—	—	—	—
12.	Aggression	—	—	—	—	—	—	—	—	—	—
13.	State-anxiety	*	*	—	—	*	*	—	*	—	—
14.	Trait-anxiety	*	*	*	—	*	*	*	*	—	—
15.	Attitude towards Culture Change	**	—	—	**	**	**	*	**	—	—

\* = LAB, MAB and ORB = Least Accultured Boys, More Accultured Boys and Oriya Boys  
 \*\* = LAG, MAG and ORG = Least Accultured Girls, More Accultured Girls and Oriya Girls

(iii) ORG possess higher total adjustment than ORG, LAB and MAB groups; and there does not exist any significant difference between all other group combinations.

(iv) ORB possess more psychoticism than ORG, MAG and LAG groups; and LAB and LAG possess more psychoticism than MAG, ORG and MAB groups; and there does not exist any significant difference between all other group combinations.

(v) Concerning neuroticism, LAG group scores significantly higher than LAB and ORG groups and MAB possess more neuroticism than ORG; and ORG possess more neuroticism than ORB groups; and there does not exist any significant difference between all other group combinations.

(vi) More extroversion is possessed by ORG and ORB groups than LAB and LAG groups; MAG and MAB possess more extroversion than LAB and LAG groups; and LAB possess more extroversion than LAG groups; and there does not exist any significant difference between all other group combinations.

(vii) LAB students expressed more inferiority feeling than LAG, MAG and ORG groups; and there does not exist any significant difference between all other group combinations.

(viii) Regarding insecurity, ORB possess more of this trait than ORG and MAG groups; and LAB possess more insecurity than LAG, MAG and ORG groups; and there does not exist any significant difference between other group combinations.

(ix) There does not exist any significant sex difference in regression, resignation and aggression between all the group combinations in frustration.

(x) ORG possess more fixation than MAB groups; and LAB and LAG groups possess more fixation in frustration than MAG, MAB and ORB groups; and there does not exist any significant difference between all other group combinations.

(xi) LAB possess more state-anxiety than ORG groups; and there does not exist any significant difference between other group combinations.

(xii) LAB possess more trait-anxiety than LAG, MAG and ORG group; and MAB possess more trait-anxiety than MAG, LAG and ORG groups; and there does not exist any significant difference between all other group combinations.

(xiii) Similarly, when attitude towards culture charge is taken into consideration, ORG and ORB groups possess increased attitude than ORB, LAB, MAB and LAG groups; and MAG and MAB possess increased attitude than LAB and LAG groups; and there does not exist any significant difference between all other group combinations.

## CONCLUSION

Studies of the present type have obvious implications for disciplines like anthropology, sociology, psychology and educational theory and practice. The

knowledge of relationships between acculturation and personality adjustment, acculturation and mental health, etc. will enable the teachers, guidance workers, and psychologists to understand the various factors contributing towards the acculturation of a particular group and the resultant adjustment of the particular group to the acculturative situation. In this way the present study is just like an incentive to the teachers, educationists, psychologists and anthropologists to bring the isolated and backward tribal communities into the main stream of society.



*Curriculum Development of Family Life Education and a Study of its Effectiveness*

(DR) MANJULA P. RAO

ADOLESCENCE is a complex process taking place in a complex world. The developmental changes that occur at biological, intellectual, psychological, social and sexual levels cause certain disturbances in adolescents, because of which adolescence is viewed as a traumatic period. In order to help adolescents to cope up with their developmental disturbances, many educational centres, state bodies, social and family welfare centres, and other agencies planned and carried out certain programmes and activities, which resulted in the area like Sex and Family Life Education. The area of family life education has varying definitions and assumptions depending upon social pressures, pressures of time, places where it has developed, and viewpoints of those who perceived the needs and tried to meet them. Due to this, it failed to arrive at a common ground of aims and objectives, hence it is difficult to say how far the programmes developed helped in promoting the healthy personality of adolescents.

Looking into the needs and requirements of adolescents which emerge out of developmental changes, it was felt essential to develop a curriculum of Family Life Education which would help in adolescents' personality development, in perceiving others, in building up healthy relationships, and in understanding and

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Ph.D. degree awarded by M.S. University, Baroda (1987).

developing a positive attitude towards the biological, psychological and sociological aspects of family.

Family Life Education in this study has been defined as an educational programme which has a function of helping the adolescent individual in developing the biological, psychological and social selves, in order to be able to adjust dynamically and without undue strain, in the broad society in which he has to live, in his sub-groups at work, in his intimate relationships of friendship, love, marriage and a family of his own.

## OBJECTIVES

The study had the following objectives :

1. To develop a curriculum of Family Life Education, phase-wise, for Standard XII science students.
2. To validate the curriculum of Family Life Education in terms of students' achievement, attitude and reactions.
3. To study the relationships between (i) socio-economic status and family adjustment, (ii) family adjustment and self attitude, and (iii) achievement and attitude of students.
4. To study the cost and time involved in developing and implementing the curriculum of Family Life Education.

## DESIGN

This study was basically a developmental effort, wherein research was concerned with development and validation of the curriculum of Family Life Education. This effort was carried out in the actual context without disturbing the setting for experimental purposes, in order to examine the inter-relationships existing among the wide range of variables in actual conditions. In this way, the investigation was designed as per the requirements of a typical a-experimental study (Guba, 1965) where the concern was to carry out investigation under actual field conditions. Although the study was confined to only one group with which the developed curriculum was experimented, one control group was employed for comparison purpose. Besides the investigation being an a-experimental study, it is also inclusive of certain aspects of basic research where understanding the interplay of certain variables and establishing relationships occur. Three such instances in the present study are : (i) relationship between achievement in the curriculum of Family Life Education and attitude developed towards the chosen element,

(ii) relationship between socio-economic status and family adjustment of pupils, and (iii) relationship between family adjustment and self-attitude of pupils.

#### SAMPLING

Two groups of 26 students each, belonging to two different English-medium schools of Baroda were chosen. One was treated as the experimental group which was subjected to the developed curriculum and another was treated as the control group. An attempt was made to achieve equivalence of groups to the extent possible on the basis of criteria like sex, age, socio-economic status and the stream of subject (science) chosen. Both the groups had 16 boys and 10 girls, respectively.

#### INSTRUMENTATION

The instruments used in the study were as follows :

1. Diagnostic tool
2. Criterion tests
3. Comprehensive tests (pre and post) in a parallel form
4. Attitude scale (based on Likert's summative rating)
5. Socio-economic status scale
6. Family adjustment inventory
7. Reaction scale

#### METHODOLOGY

There were two main phases of the study: one, the development phase and two, the validation phase. The former involved the development of the curriculum of Family Life Education for Standard XII science students, and the latter involved the validation of the curriculum developed.

##### *Phase I: Development of the Curriculum of Family Life Education*

- (a) To develop the curriculum of Family Life Education, firstly, the needs of the students were diagnosed by administering a questionnaire. Along with this, the developmental tasks associated with the adolescent development were kept in focus. These provided indices for formulating the objectives, as well as for selecting the subject matter. The curriculum development followed a sequence, like diagnosis of pupils' needs, formulation of objec-

tives, selection of content and learning experiences and evaluation. The curriculum was developed around three major themes which were (i) personality development of the adolescents; (ii) biological, psychological and sociological aspects of human sexuality; and (iii) biological, psychological and sociological aspects of the family. Thus the curriculum comprising of 13 units was structured logically in a sequential manner, so that the objectives specified for each unit were attainable by students and this was presented in the form of flow charts.

- (b) To bring about the desired behavioural changes, a set of behavioural objectives based on Bloom's Taxonomy of Educational objectives was formulated. The behavioural objectives which were adopted in the study to evaluate the desired behavioural outcomes are (i) knowledge, (ii) comprehension, (iii) application, (iv) analysis, (v) skill, and (vi) attitude.
- (c) Learning experiences were provided in the form of multi-media package which constituted programmed learning, lecture-cum-discussion, question-answer sessions, discussions, dialogue-form, case studies, audio-visual, summaries, exercises, glossary and assignments.
- (d) The instructional experiences provided in terms of terminal behaviours to be developed and the evaluation instruments were examined by experts and necessary modifications made. A pilot study was conducted to find out the suitability and appropriateness of the content, instructional components and evaluation, in terms of language ability and comprehending level. Necessary modifications were made on the basis of the data obtained and the curriculum was later implemented in the final field experimentation.

### *Phase 2: Validation of the Curriculum*

The developed curriculum was implemented for a period of three months. The criterion tests were administered at the close of each instructional unit. The comprehensive tests which were developed in the parallel form in order to avoid sensitization, were administered as pre- and post-tests. The attitude scale measuring the attitudes towards (i) self, (ii) opposite sex members, (iii) sexual matters, and (iv) marriage and family was also administered as the pre- and post-test. Reactions were sought, after the implementation of the entire curriculum, in regard to (i) the content, (ii) the learning experiences provided, (iii) the curriculum as a whole, and (iv) whether Family Life Education should be taught as a separate subject or as an integral part of the school curriculum.

TABLE 1  
Mean, SD and 't' Values Obtained in respect of Experimental and Control Groups on Comprehensive Pre- and Post-test Measures

Group.	N	r	Comprehensive Test			Obtained 't' Value	Levels of Significance	
			Pre		Post			
			Mean	o	Mean			
Experimental	26	0.39	24.92	9.05	66.78	13.06	3.40*	2.79
Control	26	0.56	22.65	4.94	23.0	5.50	0.90	2.06

\* Obtained value of 't' is significant at 0.01 level

TABLE 2  
Mean, SD and 't' Values Obtained in respect of Pre- and Post-test Measures of Attitude for Experimental and Control Groups

Attitude Test	Experimental Group			Control Group			't'	Levels of Significance	
	N	Mean	o	N	Mean	o			
Pre-test	26	56.53	8.63	26	49.8	4.90	2.72	2.06	2.79
Post-test	26	80.09	7.90	26	49.53	5.61	4.39	2.06	2.79

\* Obtained value of 't' is significant at 0.01 level



## ANALYSIS

The data on achievement and attitude were analysed descriptively by computing mean, SD and percentiles and inferentially by using students 't'. Table 1 represents the difference between the mean performance on the pre- and post-comprehensive tests for both experimental and control groups, and Table 2 represents the difference between the mean performance on the pre- and post-attitude measures for both experimental and control groups. The relationship between socio-economic status and family adjustment, family adjustment and self-attitude of students, achievement and attitude were studied by using the co-efficient of correlationship. A qualitative analysis was done on the reactions expressed by the students to the curriculum as a whole. The feasibility of the curriculum was studied in terms of time and cost. The expenditure that would be incurred for 50 sets of instructional material was worked out and the cost per student was examined.

## MAJOR FINDINGS

1. Validation of the curriculum inferred from the achievement of students on comprehensive test showed a good performance of students (experimental group), thereby showing that the curriculum was quite effective on the students (see Table 1). The criterion tests also revealed quite a good progress of students, though an average performance was noted on first two units.
2. The curriculum was found effective on students' attitude towards their self, opposite sex members, sexual matters, marriage and family. A high performance was noted for the experimental group on the post-test over the pre-test when compared to the control group (Table 2).
3. The reactions obtained towards the content, the learning experiences provided and the curriculum as a whole, were found highly positive, and hence speak of the validity of the curriculum. Most of the students opined that Family Life Education should be taught in schools as a separate subject.
4. A significant relationship was found between achievement and attitude for boys and girls belonging to the experimental group.
5. A significant relationship was found between family adjustment, self-attitude of students belonging to both the groups (experimental and control) and no relationship was observed between SES and family adjustment in both the groups.

On the whole, it was found that the developed curriculum was quite effective which was evident through students' achievement and change in attitudes. It was felt that administration of the curriculum to a larger sample belonging to various

socio-economic and cultural sectors, would yield a wider generalisation of the effectiveness of the curriculum of Family Life Education.



### *Evaluation of High School Curriculum of the Uttar Pradesh Board*

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IN the process of imparting education, curriculum has the prime importance. Curriculum puts forward the real base for educational process. It paves the way for the students to attain the educational objectives. Curriculum is the most effective medium, it effects the development of students at every stage in attaining a perfect personality. In curriculum all the experiences are added which are related with the school life, keeping in mind the personality of the learners to develop their complete individuality, effecting mental, intellectual, physical, emotional, social and moral development.

According to the old approach, curriculum meant only the subjects which were taught in the classes, but now the modern concept of curriculum has become very wide. All the experiences inside and outside the class are also included.

The main aim of curriculum is to attain all-round development of the students and society. It introduces both of them, brings them closer and after harmonising them, help their balanced development.

#### RELATED STUDIES

In India research work on curriculum has been done by Samant (1944), Gothiverker (1947), Kalker (1950), Dev and Sexena (1955), Harper Henry (1959),

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Ph.D. Degree Awarded by Gorakhpur University (1988).

Chaudhari (1962), Develkar (1967), Srivastava (1968), Pillai (1968), Chaudhari (1968), Joshi (1968), Srivastava (1969), Bahuguna (1973), Ghosal (1973), Gupta (1973), Paulabhiram (1973), Sinha (1976), Jain (1977), Dewasthali (1978), etc. In foreign countries, Rite (1967), Marris and Rein (1973), Macdonald and Clark (1973), Shaffarzick (1975), Hayes (1977), Boyed, Teylor, Roberts (1981), Stephenson (1982), Atkins (1982), Baruch (1982), Bouch (1982), Freed (1983) are known for their work in the area.

## OBJECTIVES

The objectives of the present research were :

1. To collect the views of the teachers, subject-experts and students of High School regarding the attainment of educational objectives by the study of compulsory subjects prescribed by the U.P. Board.
2. To collect the views of the above-mentioned people about the fulfilment of the needs of the students by the study of each compulsory subject.
3. To collect the views of the principles, guardians, educational authorities and members of the NCERT regarding the development of qualities of the students by the study of the total curriculum of High School.
4. To study comparatively the percentage of the views of the above-mentioned people.

## HYPOTHESES

1. The views of the high school passed boys and girls are the same regarding the attainment of educational objectives and fulfilment of needs by different compulsory subjects.
2. The views of the high school failed boys and girls are the same regarding the attainment of educational objectives and fulfilment of needs by different compulsory subjects.
3. The views of male and female teachers are the same regarding the attainment of educational objectives and fulfilment of needs by different compulsory subjects.
4. The views of the principals, teachers, educational authorities and members of the NCERT are the same regarding the development of qualities of the students by the total high school curriculum.

## METHODOLOGY

### *1. Check List for the Evaluation of Compulsory Subjects of High School Curriculum*

By this, the views of the students, teachers and subject experts regarding the attainment of educational objectives and needs through the study of compulsory subjects of high school curriculum were collected.

### *2. Check List for the Evaluation of High School Curriculum*

By this, the views of the principals, guardians, educational authorities and members of the NCERT were collected to know the development of expected qualities in the students through the total high school curriculum.

## CONCLUSIONS

1. Different sections of people did not express similar views about attaining the teaching objectives and fulfilment of needs by the students through the study of compulsory subjects in high school.
2. There was also no uniformity in the views of different sections regarding the development of different qualities in the students by the total curriculum of high school.
3. In most of the students the percentage of views for the attainment of teaching objectives and fulfilment of needs in the passed boys and girls was greater than the students who failed. There was no significant difference in the views of the passed boys and girls and male and female teachers.
4. The percentage of views of the principals was more than that of the views of the guardians, educational authorities, and members of the NCERT but there was no significant difference in most of the qualities.
5. In Hindi and Home Science more than 50 per cent and in Maths 1 less than 50 per cent teaching objectives were being attained by the students. In moral and physical education, socially useful productive work and social service, most of the objectives were not being attained by the students. In English also none of the educational objectives were being attained. The students' needs were also not being fulfilled from most of the subjects.
6. The curriculum also failed to help all-round development of the students.

It is, therefore, clear that the high school curriculum needs some reform. It should be objective and need-based. The teachers should also be made aware of these facts and they should impart teaching with this firm background.



### *Conservation Development in Blind Children*

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CONSERVATION plays a central role in the development psychology of Jean Piaget. Typically the child is shown two materials that are quantitatively and perceptually equivalent. One material is then changed by the child which maintains the quantitative properties but changes the perceptual qualities of the materials. After the changes are made, it is asked whether the quantitative aspects of the materials have been changed or not.

During the concrete operational period, children develop the ability to conserve. The development of conservation of different concepts follows certain order of appearance. Conservation of different aspects requires different pre-requisite operations. Several investigations have been attempted to test Piaget's theory by determining the kinds of experience that facilitate conservation. Canning (1957), Hatwall (1966), Miller (1969), Nash (1969), Hughs (1969), Gottesman (1971), Tobin (1972), Gottesman (1973), Simphkins and Stephens (1973), Higgins (1973), Crommer (1973), Brekke, Williams and Tait (1974), Suppes (1974), Kephart, Kephart and Schwarz (1974), Birms, Shayne Lee (1982), investigated cognitive development among blind and partially sighted children and found that there was two-to-five years developmental lag among these children in their performance on a variety of Piagetian type tasks. They follow the same developmental pattern (schema) like normal children but at a slower rate. Blind children may not have the

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Thesis submitted to the University of Rajasthan, Jaipur (1988).

same developmental pattern as sighted ones. No significant difference was found among blind, sighted and blind-folded on the age attainment of conservation.

Due to lack of experience and lack of vision the blind children lagged behind the normal children in their performance. Through proper training and proper physical environment the concept of conservation acquisition may accelerate among blind children.

#### DIFFERENCE BETWEEN PRESENT STUDY AND PAST STUDIES

A number of researches have been conducted on the development of conservation in normal children, but there are very few researches on visually handicapped children. Although researches on the visually handicapped cannot be said to be neglected area in India but hardly any work has been done on the conservation development among blind children. The present study differs from the past studies in the following aspects :

- Entire sample was drawn from the residential school MSVH National Institute for Visually Handicapped, Dehradun.
- One hundred children of both sexes of age 6+ to 16+ were taken.
- Ten conservation tasks were selected.
- Academic achievement of the children in English, Hindi and Mathematics was taken.
- Children were encouraged to manipulate the materials (Tasks) by themselves individually in the separate rooms. No time limit was set for them.
- Factor analytic approach was used in the analysis of the data.

#### AIMS AND OBJECTIVES

The present study had the following objectives :

1. To document literature in this area, if any.
2. To study the scheme of conservation in its varied aspects.
3. To study the extent to which blind children can reason formally.
4. To determine the influence of age and sex on the performance of conservation tasks.
5. To determine relationships among the scores on conservation tasks and academic attainment in school subjects.
6. To determine the mathematical structure underlying the various tests and tools used in this study.

## HYPOTHESES

It was proposed to explore the following hypotheses :

1. Like sighted children, blind children do not follow the same developmental patterns of conservation as propounded by Piaget.
2. Blind children do not conserve in similar ways on number, length, weight, area and volume and do not conserve at the same rate as sighted children.
3. To determine that age and sex do not influence the performance of conservation tasks.
4. There is no correlation between the scores of various school subjects, each taken separately.
5. There does not exist any mathematical structure among the tests and tools used in this study.

## METHOD

The tasks were presented one by one in front of the children and they were given the widest possible latitude to express verbally their views.

## TESTS AND TOOLS

### *Conservation Tasks Used*

1. Conservation of number (two tasks)
2. Conservation of length (two tasks)
3. Conservation of weight (two tasks)
4. Conservation of area (two tasks)
5. Conservation of volume (two tasks)

### *Academic Performance*

The total marks secured by the students in their main subjects (Hindi, English, Mathematics) at the end of the year (1986-87).

## MAIN FINDINGS

1. The group of blind children followed the same developmental patterns as the group of sighted children, as propounded by Piaget, but at a slower rate.
2. Main scores of each conservation task show an increasing trend with age and grade.

3. Initial performance on various conservation tasks remains quite homogeneous in the close grades and heterogeneous throughout the grade of the entire sample.
4. For all the children, the conservation of number was followed by the conservation of weight, length, area and volume.
5. As judged by 't' ratios, there was a significant difference between groups of high achievers (14-16 years) and low achievers (6-11 years) in the performance of conservation tasks.
6. There was no significant difference between the performance of low achievers and high achievers in academic attainment.
7. No sex difference appeared to exist throughout the study on conservation tasks and academic performance.
8. There was hardly any correlation between the scores of conservation tasks and the scores of school subjects (English, Mathematics and Hindi), except the scores of area conservation task which were significantly correlated with the scores on mathematics (at .01 level) and the scores of conservation of length task which were correlated with the scores of English (at .05 level).

#### FACTOR ANALYSIS

The correlation matrix of (15 × 15) variables was subjected to factor analysis to extract the maximum amount of variance and the smallest possible residuals. When the factors were subjected to factor analysis, the following four factors were obtained :

1. Achievement
2. Number
3. Mathematical ability
4. Language

#### DISCUSSION

The results obtained from the performance of the group of blind children cannot be generalised. These children were not selected randomly. It was seen that the blind children lagged behind the normal children on different conservation tasks. This might be due to the following reasons :

- Inappropriate experience in their daily routines.
- Improper ability in manipulative skills.
- Lack of information which may be due to extra care at home and negligence to which they were put in their hostels.



- Inferior complexity on the part of the consequences of their actions.
- Improper mode of instructions used by the concerned teachers.

The study revealed that blind children are not necessarily handicapped in developing cognitive and reasoning capacities. The findings can be applied to the educational evaluation of the functioning of blind children.

## EDUCATIONAL IMPLICATIONS

Due to the lack of sensory input, the perceptual processes of a blind child are deficient. The lack of vision reduces the effectiveness of tactual sense. The total environment at home and school should be so structured that each sensory experience will be effective for more meaningful learning. Early parent education and nursery programme is necessary. There should be appropriate modes of communication and dialogue during the development of educational processes. Each child should be considered to possess a unique style of adapting new learning situations. The child must be encouraged to actively manipulate his environment and physically explore objects, in order to learn about them. Education programme must be free from attitudes which limit and discourage blind children, and must help students to develop knowledge, skill and inner strength to meet and overcome these attitudes.

If the teachers involve the children in more practical tasks, many children may develop the ability to solve the set problems in their mind, but if the allied vocabulary and communication skills are not carefully built into the learning situations, they may never be called upon to explain in oral or written terms.

Curriculum should be cognitively oriented which may develop and reinforce spatial-temporal and logico-mathematical reasoning. The activities which promote cognitive development and occur naturally and easily, should be according to the cognitive-structural level of the child. The child's questions, discoveries and explorations must be valued.

"Education must aim at giving the blind a knowledge of realities around him, the confidence to cope with these realities and the feeling that he is recognized and accepted as an individual in his own right."

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## Research Notes

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### *Development of an Environmentally-oriented Curriculum in Geography at Secondary Stage*

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THE modern concept of environment has its origin in the nineteenth century. This was the period when industrialisation brought about an unprecedented alienation of man from nature. It was also the period when the world's thinkers and scholars began to introduce new ideas born out of a deeper understanding of the world around them. For instance, Charles Darwin's book on the origin of species (1859) proposed a view of how all living things are the product of environment working through the process of natural selection. This view effected our understanding of both environment and education.

In recent years, the deteriorating condition of environment has caused a global concern. Sincere efforts are being made at different levels to protect environment from further degradation. But for the success of any programme, public participation is necessary. Hence, for the first time, the importance of environmental education (EE) was emphasised in the United Nations conference held at Stockholm in 1972. One of the most important recommendations of the conference was to generate awareness about environmental problems and to propose their eventual solution. An international workshop on EE was held at Belgrade in October, 1975 which was followed by an international conference on EE held in Tbilisi organised

by UNESCO and UNEP. They outlined a substantive structure for EE and recommended policies and strategies to be followed worldwide.

During these conferences it was realized that environment does not comprise of physical and natural resources only. Environment in its holistic nature is composed of natural as well as human resources. Therefore, an integrated EE programme was evolved to bring about an overall awareness among our younger generation from the very beginning. It was realised that the first and foremost aim of environmental education is to develop active and well-informed individuals who are aware of their environment and their responsibilities in protecting and conserving environment. To achieve this aim education must develop in all individuals an understanding of the interactions and interdependence of the physical, biological, social, economic and cultural aspects of environment. In addition, individuals and communities must develop skills for identifying and solving environment problems.

#### GEOGRAPHY AND EE

As the main task of geography is to help pupils to see the interrelationship between man and his environment, geographers can play an important role in identifying the emerging problems in this relationship. The concept of relations between individual and environment is basic to geographical thinking.

By 'environment' geographers mean the sum total of conditions that surround a person at any one point on the earth's surface. For early man these conditions were largely natural, at present natural environment has been either replaced or radically modified. It shows how human activities influence their environment but the effect of environment on people cannot be ignored. Whether the effect of people on environment or the effect of environment on people is more important is a debatable question.

Geographers find it more helpful to think of both relationships as a part of human environment system. Geographers are particularly interested in systems which link together human beings and environment. Therefore, an 'eco-system' finds an important place in the field of geography and when some imbalance occurs in a particular eco-system it cannot be ignored by a geographer. Even the term 'ecology' meaning 'a house' or 'a place to live in' serves as a direct link to a geographer's concern, with the earth as the 'home of humanity'. As it has been said, the fundamental problem of geography is that of man and nature interaction. Man alone among the non-species of the planet does not just adopt himself to nature but actually interacts with it, and this interaction specially for economic development brings certain changes in the eco-system. When this process goes beyond the limits provided by nature, it brings 'ecological crisis'. Hence there is a need to realize the importance of development without destruction. Geography can

play an important role in making man aware of the limits provided by nature in each eco-system. Through teaching of geography we can make our students realize the role of man as an integral part of the eco-system.

The intention behind the introduction of EE in school curriculum, therefore, is not to add another subject. But it is an approach through which environmental problems are highlighted for solution. Hence the content necessary for realizing environmental education objectives could be carefully selected and integrated with the relevant subjects. In other words, we can as well call it an *environmental approach* which could aim to evolve an environmental ethics, i.e. a balanced way of thinking, feeling and acting towards environment.

It should achieve a new dimension that focusses on solving environmental problems and evoking a new type of development with environmental constraints on what has been referred to development without destruction.

Human beings have always had to be good geographers in order to survive. It has always been necessary to possess a keen awareness of the physical features of one's surroundings, of where water can be found, of the places where certain crops can be grown, etc. All this is deep within everybody. Geography, at its grassroots, clarifies or explains the complexity of human environment and the ability necessary to survive there.

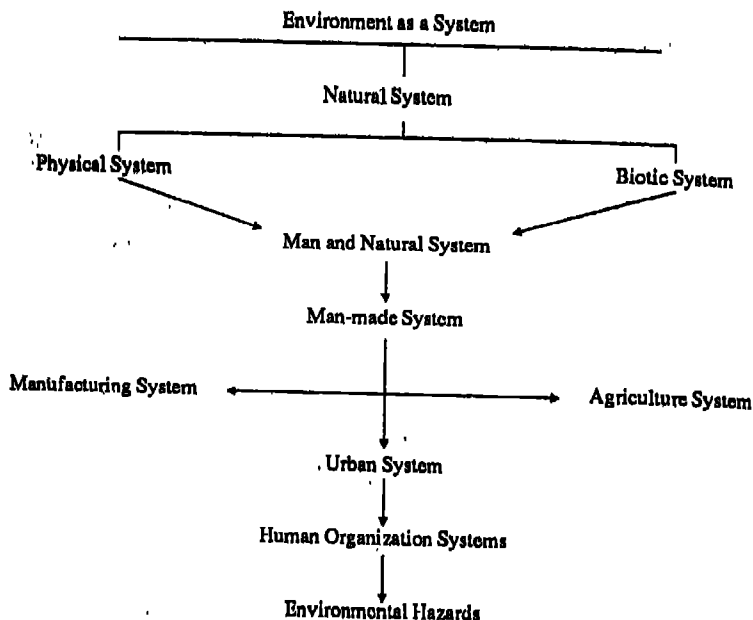
In the days of highly complex technological societies it is no longer sufficient to be concerned with our own immediate surroundings. In the human terms, the globe is shrinking. As we are aware, the political and technological activities of developed countries affect the economy of the whole world. Therefore, we can say that as the world has grown smaller, the boundaries of geography have extended. The knowledge of ecology of different areas has become a necessity for a student of geography. There are a number of organisational frameworks used in the development of geography curriculum, e.g. continental and regional structure, conceptual structure, etc.

## CURRICULUM DEVELOPMENT

In the same way an environmental approach in geography curriculum could be infused through selection of a specific pattern or a combination of various patterns.

A conceptual model for curriculum development based on the eco-system paradigm (Norman J. Graves, 1982) could be used as a basis, as the comprehension of some concepts is necessary to understand various ecological problems as well as in finding their solution.

In this model the content of geography could be divided into two broad categories, *physical environment* and *biotic environment*, as shown in the following diagram :



### CURRICULUM DEVELOPMENT BASED ON THE ECOSYSTEM PARADIGM (N.J. GRAVES, 1982): A CONCEPTUAL MODEL

Any selected pattern provides a guideline for translating aims into educational objectives under the category of knowledge, skills and values. And from these objectives instructional units can be organised. Therefore, the following educational objectives may be achieved through this approach.

#### *Objectives*

##### *Knowledge:*

- (a) of concepts like eco-systems, energy flow, homeostasis, population, pollution, resources, environments, food chain, etc.;
- (b) that man is an integrated part of a system consisting of physical, biological and socio-cultural environments;
- (c) that man is centrally placed in the system and can alter the inter-relationship within it;

- (d) that the nature and magnitude of changes in the system are a result of man's decisions and activities;
- (e) that man's decisions and activities can adversely affect the quality of present and future environments; and
- (f) that man produces these changes and hence it is possible to improve or maintain the quality of environment.

*Skills in:*

- (a) the use of problem-solving techniques in identifying and helping to resolve an environment issue;
- (b) collecting new information regarding an environmental issue from his/her own immediate environment; and
- (c) the use of various methods e.g. project work, field work, etc.

*Values to provides the basis of developing:*

- (a) a concern for the quality of life in local, national and global human eco-systems which will motivate students to participate in solving these problems;
- (b) an attitude of objectivity in enquiry;
- (c) an awareness of the need for planned use and conservation of resources; and
- (d) an awareness of the importance of co-operation with other members of community for the purpose of solving problems in human eco-system.

These educational objectives provide guidelines for selecting an organised course content.

*Hierarchical Structure*

The following hierarchical structure could be used for the development of geography curriculum at secondary stage.

Major concepts	Component concepts
I. Environment as a system	— Physical and Biological
1. Physical (abiotic)	
1.1 Atmosphere	— Composition, photosynthesis heat balance, insolation, terrestrial radiation, weather and climate, hydrological cycle, rainfall, temperature zones pressure and wind.

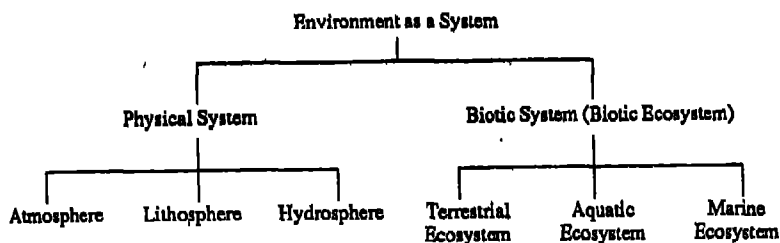
- 1.2 Lithosphere
  - Rocks, and minerals, land forms, soils, soil profile, soil erosion, weathering and erosion.
- 1.3 Hydrosphere
  - Ocean, global water balance, ocean floor, salinity, ocean current, water on land—rivers, lakes, glaciers and underground water.
- 2. Biotic System
  - Ecosystems
    - Food chain, food web, energy flow, homeostasis.
  - 2.1 Terrestrial Ecosystem
    - Tundra, desert, temperate, grasslands, savanna grasslands, boreal forest, temperate deciduous forest, tropical rain forest.
  - 2.2 Aquatic Ecosystem
    - Euphotic zone, fresh water ecosystems, lakes, aquatic ecotones, estuaries, deltas, intertidal zone, neritic zone and oceanic zones.
- 3. Human Population
  - Growth of human population, carrying capacity, population pressure, urban and rural population, birth rate, death rate, growth rate, population pyramid, saturation levels.
- 4. Resources
  - 4.1 Renewable
  - 4.2 Non-renewable
  - 4.3 Inexhaustible
  - 4.4 Cyclic
  - Resource management
- 5. Environmental Hazards
  - Conflict in man and environment relationship
  - Air, water, soil and noise
- 5.1 Pollution
- 5.2 Ozone concern
- 5.3 Acid rains
- 5.4 Toxic wastes
- 5.5 Radiation perils
- 5.6 Desertification
- 5.7 Deforestation



### Teaching Methods

The above-mentioned course plan could be easily taught through various models of information processing, for example, Ausubel's advance organizer model in which a structure of ideas and information is presented in the beginning of the lesson, act as a connection between material to be learned and the learner's cognitive structure. According to Ausubel, it is based on deductive model, where the broader ideas are presented first and are followed by more specific ideas. Learning could be more meaningful if what is learnt is intellectually linked and understood in the context of what is previously learnt. It also implies that this knowledge can be transferred and applied creatively to the new situation.

Therefore, a geography teacher can easily develop his/her lesson on the basis of Ausubel's advance organizer model or other similar models. In this way a conceptual hierarchy could be presented as shown in the following diagram:



In the same way each *subordinate* concept could be divided into a *coordinate* concept as given in the hierarchical structure to make learning more meaningful.

As no single strategy could be effectively employed to achieve all the instructional objectives, a geography teacher should employ any one or a combination of the following strategies in different situations for clarifying various concepts :

1. Problem-solving
2. Experimentation
3. Case Studies
4. Field Studies
5. Project
6. Survey
7. Discussion or Debate

## CONCLUSION

It has been attempted in this paper to present a framework for an environmentally-oriented geography curriculum at secondary stage and to stress that a geographer does make valuable contributions in the growth of a relevant and vital subject like environmental education. The role of education and of the teacher in encouraging a better knowledge and understanding of local, regional and world environment is obviously a central one. If these areas of studies have to be presented in a systematic manner, we shall require personnel with a thorough grounding in EE. The specialist skills and knowledge of geographers are vital in this regard.

It is essential to recognise that geographers are already contributing very substantially to the philosophy and practice of EE as it has developed so far, and will be playing a more significant role in the future.

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*Relationship Between Job Satisfaction and Some Personal Traits  
of Professional Women*

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EDUCATION is a social process by which knowledge is transferred to students through the intermediaries of teachers. By being exposed to a variety of knowledge, female students receive valuable information about themselves, their tastes, talents and capabilities. An important function of education is also to assist women in the economic sphere by helping them to locate those jobs in which they can most successfully and productively contribute. The New Educational Policy, therefore, visualises matching education with employment. "This would require a scientific analysis of the job requirements for various positions, and tailoring appropriate programmes of education and training to impart the knowledge and skills required for the performance of the jobs." Therefore, it is contemporary concern to see interrelationship between job satisfaction and some personal traits of professional women.

The studies conducted earlier on this aspect have reported contradictory results. Super (1939) found that job satisfaction showed cyclical changes with age. Some studies showed that job satisfaction was higher with the increase in age (Muthayya and Gnanakannan, 1973; Barber, 1980; Goyal 1981; Saxena and Sethia, 1984). Some studies showed no relationship between age and job satisfaction (Anand, 1979; Loftland, 1985).

Many studies revealed that pay was an important factor for job satisfaction of employees.

Morse's (1953) study on white collar workers indicated that those who had not completed higher school were the most satisfied. Other studies (Fryer, 1926; Hoppock, 1935) showed that there was tendency for more educated workers to be more satisfied. On the contrary, Anand (1975), Saxena and Sethia (1984) found that more qualified persons were more satisfied.

According to Barber (1980), Muthayya and Gnanakannan (1973), persons having more experience were more satisfied with their jobs. Rajammal (1982) found experienced workers to be more satisfied. Mealey (1984) and Loftland (1985) found that job experience did not affect job satisfaction.

Another very pertinent and perhaps important point is that the researches so far carried out in the domain of job satisfaction in India or abroad, considered relationship between job satisfaction and other variables on the basis of simple correlation. This may be considered as a drawback of the research design of earlier studies. The relationship between the two variables may have the effect of other variables, which were, perhaps, not taken into account. In the present study, the effect of other variables was partialled out to find out the real relationship between job satisfaction and any other variable and to draw unbiased inferences.

## OBJECTIVES

The present study had the following objectives :

1. To find out the relationship between job satisfaction and age of women working in different professions.
2. To find out the relationship between job satisfaction and educational qualifications of women working in different professions.
3. To find out the relationship between job satisfaction and pay of women working in different professions.
4. To find out the relationship between job satisfaction and professional experience of women working in different professions.

## HYPOTHESES

The following statistical null hypotheses (Ho) and corresponding research hypotheses (HR) were formulated in order to realize the objectives of the study :

1. Ho: There is no significant relationship between job satisfaction and age of women working in different professions.  
HR: Job satisfaction does not vary directly with age, but shows a cyclical change. Therefore, the research hypothesis is kept open-ended and no a-priori research hypothesis is formulated.
2. Ho: Job satisfaction and educational qualifications of women in different professions are not significantly related.  
HR: Contradictory results are available for the relationship between educational qualification and job satisfaction. Hence, the research hypothesis is kept open-ended and no a-priori research hypothesis is formulated.
3. Ho: Job satisfaction and pay are not significantly related for women working in different professions.

HR: Researches indicate that pay is related to job satisfaction. Hence, the research hypothesis expects a positive relation between job satisfaction and pay.

4. Ho: There is no significant relationship between job satisfaction and professional experience of women working in different professions.

HR: There are conflicting views regarding the relationship between professional experience and job satisfaction. Therefore, the research hypothesis is kept open-ended with no formulation of an a-priori research hypothesis.

## DESIGN

The present investigation, being an ex-post-facto research, was conducted on the population of 393 women working in teaching, medical and banking/insurance professions of Varanasi. Out of 393 professional women, 284 were from teaching, 68 from medical and 41 from banking/insurance profession. To draw the sample, the incidental and purposive sampling technique was employed.

## TECHNIQUES OF DATA COLLECTION

Altogether four instruments were used for this study. One of these four tools was the criterion test, i.e. job satisfaction inventory which was developed by the investigator herself. Other tools were Vyaktitva Parakh Prashnavali by Dr M.S.L. Saxena, Socio-economic Status Scale by Dr B. Kuppaswamy and Teacher's Attitude Inventory by Dr S.P. Ahluwalia. The reliability of the newly developed job satisfaction inventory was 0.74 through the test-retest reliability method, 0.89 through the split half method and 0.85 through the K.R. formula .20. Validity was established through the concurrent validity and criterion related validity methods.

## ANALYSIS AND INTERPRETATION OF DATA

To find out the relationship between different variables of professional women, partial correlations were computed by partialing out the effect of age, experience, adjustment, socio-economic status and attitudes (attitude in case of female teachers only). Computation of partial correlations extended from first order to even fifth and sixth order.

Table 1 presents the relationship between job satisfaction and other variables of professional women.

TABLE I Sixth and Fifth Order Partial Correlation Coefficients between Job Satisfaction (JS) and Other Variables of Women Working in Different Professions						
Professions	Variables	Simple 'r'	Partial 'r'	Order 'r'	SE of Partial (r)	Level of Significance
1	2	3	4	5	6	7
Teaching (N = 284)	JS and Age	-0.028	0.013	6th	0.060	N.S.
	JS and Educa- tional Qualifi- cations	-0.032	-0.028	6th	0.060	N.S.
	JS and Pay	-0.041	0.056	6th	0.060	N.S.
	JS and Profes- sional Experi- ence	0.042	0.082	6th	0.060	N.S.
Medical (N = 68)	JS and Age	-0.060	-0.015	5th	0.126	N.S.
	JS and Educa- tional Qualifi- cations	0.435	0.066	5th	0.126	N.S.
	JS and Pay	0.239	-0.129	5th	0.126	N.S.
	JS and Profes- sional Experi- ence	-0.184	-0.114	5th	0.126	N.S.
Banking/ Insurance (N = 41)	JS and Age	-0.276	-0.301	5th	0.166	Significant at 0.05 level
	JS and Educa- tional Qualifi- cations	0.018	-0.336	5th	0.166	Significant at 0.01 level
	JS and Pay	0.173	0.427	5th	0.166	Significant at 0.05 level
	JS and Profes- sional Experi- ence	-0.183	-0.390	5th	0.166	Significant at 0.05 level

Table 1 reveals that none of the partial 'r' between job satisfaction and age were significant for women working in teaching; medical and banking/insurance professions. Thus, hypothesis (Ho: 1) that there is no significant relationship between job satisfaction and age of women in different professions is retained.

A critical observation of Table 1 indicates that a highly significant product moment correlation coefficients ( $r = 0.435$ ,  $df = 66$ ) for women in the medical profession turned out to be a non-significant partial 'r' (0.66) when the effects of age, pay, professional experience, adjustment and socio-economic status were partialled out. On the contrary, a non-significant simple correlation ( $r = 0.018$ ,  $df = 39$ ) for women in the banking/insurance profession gave rise to significant

negative partial 'r' ( $-0.336$ ) when the effects of pay, age, professional experience, adjustment and socio-economic status were partialled out. The situation for women teachers, however, remained unchanged as simple 'r' and partial 'r' both were non-significant. These results point towards the acceptance of the hypothesis ( $H_0: 2$ ) that job satisfaction and educational qualifications of women in different professions are not significantly related. To accept this hypothesis wholeheartedly, repetition of researches to find out the real relationship between job satisfaction and educational qualifications of women in the banking/insurance profession is needed. Further researches with more number of women in the banking/insurance professions may help to avoid type-I error in drawing influences (Garrett, 1962, p. 222).

An observation of Table 1 shows that the partial coefficient of correlation ( $0.427$ ) between job satisfaction and pay of women working in the banking/insurance profession is significant at  $0.01$  level of significance. Partial 'r' ( $0.056$ ) and ( $-0.129$ ) for the teaching and medical profession, respectively, are not even significant at  $0.05$  level. The partial 'r' for the banking/insurance profession was arrived at through a comparatively small number of cases ( $N = 41$ ) with five number of variables partialled out. There is always a caution to interpret this type of result in terms of its significance. "Coefficients which are misleading by high or low may be obtained when studies which involve many variables are based on relatively few cases" (Garrett, 1962, p. 421). Hence, the hypothesis ( $H_0: 3$ ) that job satisfaction and pay are not significantly related for women in different professions is finally retained.

A careful observation of Table 1 reveals that there is substantial change in the value of partial 'r' ( $-0.390$ ) from simple 'r' ( $-0.183$ ) in the case of women in the banking/insurance profession only. This negative value of partial 'r' was significant at  $0.05$  level. For women in the teaching and medical profession, the values of partial 'r's were not significant. The hypothesis ( $H_0: 4$ ) that no significant relationship exists between job satisfaction and professional experience of women in different professions, is finally retained. This hypothesis is also not rejected even in the case of banking/insurance profession, as interpreting the partial 'r' with a less number of cases and more number of variables did not allow the researcher to partially reject the hypothesis.

## CONCLUSIONS

Relationship between job satisfaction and age of women working in all the three professions is not significant when the effects of educational qualifications, pay, professional experience, adjustment, socio-economic status and attitude (only for teachers) were partialled out.

Relationship between job satisfaction and educational qualification is not significant for women in teaching and medical professions when the effects of age, pay, profession, socio-economic status and attitude (only for teachers) were partialled out. However, a moderately significant negative relationship is found for women in banking/insurance profession.

Relationship between job satisfaction and pay of women working in the teaching and medical professions is not significant when the effects of educational qualifications, age, professional experience, adjustment, socio-economic status and attitude (teachers only) were partialled out. However, partial relationship between job satisfaction and pay is positive and significant for women in the banking/insurance profession.

Relationship between job satisfaction and professional experience of women working in the teaching and medical professions is not significant when the effects of educational qualifications, age, pay, adjustment and socio-economic status and attitude (for teachers only) were partialled out. However, a moderate significant negative partial relationship exists for women in the banking/insurance profession.

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## *Prediction of Student-teacher Performance in Secondary Teacher Education Course*

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THE National Policy on Education (1986), the Programme of Action of NPE (1986), the National Commission on Teachers—I and II (1983-85), the Education Commission (1964-66) and the Secondary Education Commission (1952-53) have rightly stressed the significant role teachers play in the improvement of the educational system and in the development and growth of the educand. The teacher's role is viewed in terms of a mediator, facilitator and director of learning; a helper and controller of the learning and behaviour of the learner; a dispenser of knowledge; a counsellor; an evaluator of the learner's performance in the academic field; an expert in class management activities; and a link between school, parents, community, and society.

In order to have a turnout of competent teachers, it is essential to attract a sufficient supply of competent, talented and high quality candidates to the teacher education course through effective, uniform and rigorous criteria. Research in the area of inputs is important as it provides the programme planners and educational administrators with information useful in effective identification and selection of prospective teacher education students. Moreover, an understanding of the characteristics of teachers can enable a candidate to have progressively better understanding of his personal qualifications for the programme before entering it. It can also be closely linked with the guidance and counselling programme.

## OBJECTIVES

The present study was designed to realize the following objectives :

1. To predict student-teacher performance in theory courses on the basis of selected context variables.
2. To predict student-teacher performance in practice teaching on the basis of selected context variables.
3. To predict student-teacher aggregate performance on the basis of selected context variables.

## HYPOTHESES

The following null hypotheses were formulated for empirical verification :

- Ho1 The student-teacher achievement scores as measured by theory courses cannot be significantly predicted from their scores on context variables against the alternative hypothesis that at least one of the context variables significantly explains the variations of dependent variable, that is, its regression co-efficient is significantly different from zero.
- Ho2 The student-teacher achievement scores as measured by practice teaching cannot be significantly predicted from their scores on context variables against the alternative hypothesis that at least one of the context variables significantly explains the variations of dependent variable, that is, its regression co-efficient is significantly different from zero.
- Ho3 The student-teacher achievement scores as measured by the total assessment of the teacher education course cannot be significantly predicted from their scores on context variables against the alternative hypothesis that at least one of the context variables significantly explains the variations of dependent variable, that is, its regression co-efficient is significantly different from zero.

## VARIABLES SELECTED

Four student-teacher properties, namely, general mental ability (GMA), knowledge of two school teaching subjects (ST) (cognitive variables) attitude towards the teaching profession and its allied aspects (TAP) and anxiety (AY) (non-cognitive variables) were selected. Another cognitive variable, i.e. previous academic attainments (PAA) represented student-teacher formative experience. These five variables were termed as context variables. Student-teacher achievement scores in

theory, practice teaching and final assessment of the secondary teacher education course were selected as product variables.

### TOOLS USED

The following tools were selected for the collection of data :

1. Group Test of General Mental Ability (GMAT)
2. Scholastic Test (ST)
3. Teacher Attitude Inventory (TAI)
4. Anxiety Scale (AS)

The following two tools were developed by the investigator :

1. Student-Teacher Information Blank (STIB)
2. Training Performance Information Blank (TPIB)

### SAMPLE

Two hundred student-teachers from eight colleges of education formed the sample of the study. The number of student-teachers was incidental in the sense that one-third of the number of student-teachers in arts and science streams present on the day of data collection in a selected college were taken for the study.

### COLLECTION OF DATA

Data were collected in two phases. During the first phase, GMAT, ST, TAI, AS and STIB were administered, in the beginning of the session, to the selected sample of student-teachers to obtain information on different context variables as well as on different items relating to their educational background. During the second phase, information regarding student-teacher performance in the final examination was collected.

### DELIMITATIONS

The study was confined to full-time, one-year secondary teacher education course offered by independent colleges of education located in the urban area and run either by the state government or the NCERT. Further, it was limited to student-teachers offering methods of teaching from arts and science streams. Lastly, it was confined to five context variables, namely, GMAT, ST, PAA, AS and TAI and three

product variables of student-teacher performance in theory, practice teaching and final assessment.

## ANALYSIS OF DATA

The results flowing from step-wise multiple regression for different product variables are as follows:

### *Multiple Regression Analysis on Product Variable of Theory*

The product variable of achievement in total assessment of theory (TAT) is regressed step-wise on probable predictor variables. The first variable with non-significant 'b' co-efficient that enters the regression is encountered at step 3. Hence, the results of step 2 and 3 are summarised in Table 1.

Table 1 shows that at step 2, the product variable TAT is regressed upon the context variables GMAT and PAA. The obtained value of multiple R is 0.4426 and that of  $R^2$  is 0.1959. The corresponding F-value (23.99) is greater than the tabulated F-value of 4.78 at 0.01 level for 2 and 197 degrees of freedom. Since  $R^2$  is 0.1959, 19.59 per cent of variation is explained by the joint effect of these two variables—GMAT and PAA. The value of 'b' co-efficient for the context variables GMAT and PAA is 0.1275 and 0.9584 respectively, and their F-values are 21.88 and 13.56 which are also significant at 0.01 level. Therefore, these two context variables—GMAT and PAA—are retained as significant predictors of student-teacher performance in TAT. The multiple regression equation is:

$$\text{TAT} = 44.2147 + 0.1275 \text{ GMAT} + 0.9584 \text{ PAA}$$

Ninety-nine per cent fiducial intervals for the values of 'b' co-efficients are  $0.1275 \pm 3 \times 0.0273$  and  $0.9584 \pm 3 \times 0.2603$ , respectively. Also, as the standard error of estimate is 5.3877, there is less than one per cent chance that the true value will lie outside the interval (estimated value  $\pm 3 \times 5.3877$ ).

Table 2 is a summary of the complete regression analysis of the product variable TAT with all the five steps as given by the computer.

Table 2 provides multiple R,  $R^2$ ,  $R^2$  change, per cent variance and per cent increment in variance. GMAT variable explains the maximum variance (14.05%) in TAT of student-teacher performance in the professional course, followed by PAA (5.54%), ST (0.19%), AS (0.11%) and TAI (0.04%). A total of 19.93 per cent variation is explained by all the five variables. The cognitive variables (GMAT, ST and PAA) alone explain 19.78 per cent of the variance. Of these three cognitive variables, GMAT and PAA contribute significantly (19.59%) towards per cent of variance being explained in the product variable TAT. The remaining three variables, namely, ST, AS and TAI together explain 0.34 per cent variation which is

TABLE 1  
Step-wise Multiple Regression on the Product Variable TAT (Steps 2 and 3)

Step	Context Variables	R	R <sup>2</sup>	Std Error of Estimate	F-value	b' Coefficient	Std Error of b'	F-value for b'	Constant	Beta Coefficient	Simple Correlation
2	GMAT PAA	.4426	.1959	5.3877	23.99	.1275 .9584	.0273 .2603	21.88 13.56	44.2147	.3100 .2440	.3749 .3264
3	GMAT PAA ST	.4447	.1978	5.3951	16.11	.1182 .9284 .0425	.0306 .2644 .0626	14.92 12.33 0.46	43.8844	.2872 .2364 .0505	.3749 .3264 .2555

TABLE 2  
Summary of Multiple Regression on the Product Variable TAT

Variables	R	R <sup>2</sup>	R <sup>2</sup> Change	% Variance	% Increase in Variance
GMAT	.3749	.1405	.1405	14.05	—
PAA	.4426	.1959	.0554	19.59	5.54
ST	.4447	.1978	.0019	19.78	0.19
AS	.4459	.1989	.0011	19.89	0.11
TAI	.4464	.1993	.0004	19.93	0.04

TABLE 3  
Step-wise Multiple Regression on the Product Variable TAPT (Steps 3 and 4)

Step	Variables	R	R <sup>2</sup>	Std Error of Estimate	F-value	b' Coefficient	Std Error of b'	F-value for b'	Constant	Beta Coefficient	Simple Correlation
3	TAI ST AS	.3048	.0929	7.4308	6.69	.0482 .1503 .0521	.0133 .0799 .0295	13.23 3.54 3.12	54.3552	.2609 .1380 .1242	.2284 .0888 .1697
4	TAI ST AS PAA	.3183	.1013	7.4153	5.50	.0470 .1762 .0525 .4848	.133 .0820 .0294 .3596	12.58 4.62 3.19 1.82	52.7983	.2544 .1617 .1252 .0953	.2284 .0888 .1697 .0795

TABLE 4

Summary of Multiple Regression on the Product Variable TAPT						
Variables	R	R <sup>2</sup>	R <sup>2</sup> Change	% Variance	% Increase in Variance	
TAI	.2284	.0572	.0522	5.22	—	
ST	.2801	.0785	.0263	7.85	2.63	
AS	.3048	.0929	.0144	9.29	1.44	
PAA	.3183	.1013	.0084	10.13	0.84	
GMAT	.3188	.1016	.0003	10.16	0.03	

TABLE 5

TABLE 5 Step-wise Multiple Regression on the Product Variable TA (Steps 2 and 3)											
Step	Context Variables	R	R <sup>2</sup>	Std Error of Estimate	F-value	'b' Coefficient	Std Error of 'b'	F-value for 'b'	Constant	Beta Coefficient	Simple Correlation
2	GMAT PAA	.3194	.1020	4.8052	11.19	.0772 .5894	.0243 .2322	10.07 6.45	51.9061	.2222 .1778	.2695 .2369
3	GMAT PAA TAI	.3363	.1131	4.7877	8.33	.0548 .5892 .0149	.0282 .2313 .0095	3.78 6.49 2.44	49.7337	.1577 .1778 .1234	.2695 .2369 .2307

TABLE 6

Summary of Multiple Regression on the Product Variable TA						
Variables	R	R <sup>2</sup>	R <sup>2</sup> Change	% Variance	% Increase in Variance	
GMAT	.2695	.0726	.0726	7.26	—	
PAA	.3194	.1020	.0294	10.20	2.94	
TAI	.3363	.1131	.0111	11.31	1.11	
AS	.3426	.1174	.0043	11.74	0.43	
ST	.3432	.1178	.0004	11.78	0.04	

negligible in comparison to the cost and labour of using three more tests. Hence, GMAT and PAA turn out to be significant predictors of student-teacher performance in TAT. Finally, the table reveals that the five variables account for approximately one-fifth of the total variance, while four-fifths of the variance remain unexplained, indicating that other factors are also responsible for the prediction of student-teacher performance in theory. It is, thus, clear that the null hypothesis is rejected and there is no evidence against the alternative hypothesis that at least one of the context variables does contribute significantly towards the variations in the product variable TAT. Singh (1969) also reported intelligence and indices of early academic achievement among predictors of success in theory in the B.Ed. course. Gupta (1984) reported that B.Ed. theory marks were best predicted by marks in degree examination, intermediate examination and post-graduate examination.

#### *Multiple Regression Analysis on Product Variable of Practice Teaching*

The product variable of achievement in total assessment of practice teaching (TAPT) is regressed step-wise on probable predictor variables. The first variable with non-significant 'b' coefficient that enters the regression appears at step 4. Hence, the results of steps 3 and 4 are summarised in Table 3.

It can be seen from Table 3 that at step 3, the product variable TAPT is regressed upon the context variables TAI, ST and AS. The obtained value of multiple R is 0.3048 and that of  $R^2$  is 0.0929. The corresponding F-value (6.69) is greater than the tabulated value of 3.94 for 3 and 196 degrees of freedom. Since  $R^2$  is 0.0929, 9.29 per cent of variation is explained by the joint effect of the three variables—TAI, ST and AS. The values of 'b' coefficients for the context variables TAI, ST and AS are 0.0482, 0.1503 and 0.0521, respectively, and their F-values are 13.23, 3.54 and 3.12, respectively. The first F-value is significant at 0.01 level while the latter two are significant at 0.05 level. Therefore, these three variables—TAI, ST and AS—emerge as significant predictors of student-teacher performance in TAPT. The multiple regression prediction equation may be written as :

$$\text{TAPT} = 54.3553 + 0.0482 \text{ TAI} + 0.1505 \text{ ST} + 0.0521 \text{ AS}$$

Ninety-nine per cent fiducial intervals for the values of 'b' coefficients of TAI are  $0.0482 \pm 3 \times 0.133$ , and of the 'b' coefficients for ST and AS are  $0.1503 \pm 3 \times 0.0799$  and  $0.0521 \pm 3 \times 0.0295$ , respectively. As the standard error of estimate is 7.4308, there is less than one per cent chance that the true value will lie outside the interval (estimated value  $\pm 3 \times 7.4308$ ).

A summary of the computer regression analysis of the product variable TAPT with all the five steps as given by the computer is shown in Table 4.

It is clear from Table 4 that the context variable TAI explains the maximum variance (5.22%) in the product variable TAPT, followed by ST (2.63%), AS (1.44%), PAA (0.84%) and GMAT (0.03%). Of all the five variables that contribute 10.16 per cent variation in the product variable, 9.29 per cent variation is explained by TAI, ST and AS. Hence, these three variables turn out to be significant predictors of TAPT. Therefore, the null hypothesis is rejected. As such, there is no evidence against the alternative hypothesis that at least one of the context variables does contribute significantly towards the variations in the product variable TAPT.

The finding that TAI contributes significantly as a predictor of student-teacher performance in TAPT is supported by Vashishtha (1973). Noad (1979) found that educational attitudes contributed 14 per cent variance in student-teacher performance in practice teaching. Schivley (1976) and Bilbo (1972) found attitudes to be ineffective and least efficient in predicting student-teaching success. AS has emerged as the third predictor of student-teaching success. In Bilbo's (1972) study also, AS turned out to be the second predictor of student-teaching performance for the total group.

#### *Multiple Regression Analysis on the Product Variable of Total Assessment*

The response variable of total assessment of student-teacher performance in secondary teacher education course (TA) is regressed step-wise on the context variables. The first variable with non-significant 'b' coefficient that enters the regression appears at step 3. As such, the results of steps 2 and 3 are summarised in Table 5.

It is evident from Table 5 that at step 2, TA is regressed upon the context variables GMAT and PAA. The obtained value of multiple R is 0.3194 and that of  $R^2$  is 0.1020. The corresponding overall F-value is 11.19 which is greater than the tabulated value of 4.78 at 0.01 level for 2 and 197 degrees of freedom. Since  $R^2$  is 0.1020, 10.20 per cent of variation is explained by the joint effect of the two variables GMAT and PAA. The obtained values of 'b' coefficient of the context variables GMAT and PAA are 0.0772 and 0.5894 and the F-values are 10.07 and 6.45, respectively, which are significant at 0.01 level. Hence, these two variables are retained as predictors of student-teacher performance in the professional course. The multiple regression prediction equation is as under :

$$TA = 51.9061 + 0.0772 \text{ GMAT} + 0.5894 \text{ PAA}$$

Ninety-nine per cent fiducial intervals for the values of 'b' coefficients are :  $0.0772 \pm 3 \times 0.0243$  and  $0.5894 \pm 3 \times 0.2322$ , respectively. As the Standard Error of Estimate is 4.8052, there is less than one per cent chance that the true value will lie outside the interval (estimated value  $\pm 3 \times 4.8052$ ).



A summary with complete regression analysis of TA as received from the computer is given in Table 6.

Table 6 shows that maximum variation in the criterion variable TA is explained by the context variable GMAT (7.26%), followed by PAA (2.94%), TAI (1.11%), AS (0.43%) and ST (0.04%). Thus, only GMAT and PAA emerge as significant predictors of student-teacher performance in TA. Variation to the point of 10.20 per cent is explained by the joint effect of GMAT and PAA. The contribution made by the remaining three variables is 1.58 per cent only and hence these are not taken as significant predictors. Therefore, the null hypothesis is rejected. There is no evidence against the alternative hypothesis that at least one of the context variables does contribute significantly towards the variations in the product variable TA.

## FINDINGS

Significant findings emerging from the study are given below :

1. Context variables GMAT and PAA have emerged as significant predictors (first and second, respectively) of student-teacher performance in TAT. The two variables jointly explain 19.59 per cent variation in the product variable TAT.
2. Context variables TAI, ST and AS have emerged as significant predictors (first, second and third, respectively) of student-teacher performance in TAPT. All the three predictors jointly explain 9.29 per cent variance in TAPT. Thus, both cognitive and non-cognitive variables predict performance in TAPT.
3. Context variables GMAT and PAA are found to be significant predictors (first and second, respectively) of student-teacher performance in TA. The two variable jointly explain 10.20 per cent variance in the product variable TA.
4. None of the non-cognitive variables has emerged as significant predictors of performance in TAT and TA.
5. Different sets of predictors/characteristics/qualities are needed for predicting performance in total assessment of theory and practice teaching.

## IMPLICATIONS

The study has implications for educational planners, administrators and teacher-educators involved in planning and executing pre-service teacher education programmes, as also for selection of candidates for admission to teacher education institutions. GMAT, PAA, ST, TAI and AS may comprise a battery of tests

for screening and selection of potentially suitable, talented and committed candidates for admission to the professional course and who are likely to benefit by it and be suitable for the teaching profession. It is rightly believed that effectiveness of a professional course is influenced, to a large extent, by the admission and selection criteria.

It also suggests different combinations of context variables, in order of importance, which can form useful sets of predictors of student-teacher performance in TAT, TAPT and TA. Prediction of performance may be made separately for theory papers and practice teaching since the two groups of subjects are found to require different combinations of context variables for predicting success in theory, practice teaching and total assessment.



### *Cooperation-based Learning Strategies for Disabled and Non-disabled Children in Integrated Settings*

KAMLESH RAI

PLACING Disabled students in a regular classroom is the beginning of an opportunity to influence disabled students' lives deeply by promoting constructive relationships between them and their non-disabled peers. Like all opportunities, however, integration carries the risk of making things worse as well as the possibility of making things better. If integration goes badly, disabled students will experience increased stigmatization, stereotyping, and rejection. Even worse, they may be ignored or treated with paternalistic care. If integration goes well, true friendships and positive relationships will develop between disabled and non-disabled students. The essential question is, what does the regular classroom teacher do to ensure that integration goes well? The answer to this question goes beyond constructive teacher-student interaction and providing students with appropriate instructional materials. The answer is found in how relationships among students are structured.

Integration is based on the assumption that placing heterogeneous students (in terms of disabled conditions) in the same school and classroom will facilitate positive relationships and attitudes among the students. Yet, there is considerable disagreement as to whether there are conditions under which physical proximity between disabled and non-disabled students will lead to constructive relationships. The lack of theoretical models and apparently inconsistent research findings have left the impression that integration may not be working and may not be constructive. One of the key factors identified by the research as determining whether integration promotes positive or negative relationships among heterogeneous students is whether students cooperate, compete, or work independently on their academic assignments. By structuring positive, negative, or no interdependence among heterogeneous students during academic learning situation, teachers can influence the pattern of interaction among students and the interpersonal attraction that results (Deutsch, 1962; Johnson and Johnson, 1975, 1984a; Johnson, Johnson, Holubec and Roy, 1984).

#### TYPES OF INTERDEPENDENCE

In any classroom, teachers may structure academic lessons so that students are (a) in a win-lose struggle to see who is best, (b) learning individually on their own without interacting with classmates, or (c) learning in pairs or small groups helping each other master the assigned material. When lessons are structured competitively, students work against each other to achieve a goal that only one or a few students can attain. Students are graded on a curve, which requires them to work faster and more accurately than their peers. In a competitive learning situation, students' goal achievements are negatively correlated, when one student achieves his or her goal, all others with whom he or she is competitively linked fail to achieve their goals. Students seek outcomes that are personally beneficial but also are detrimental to the others with whom they are competitively linked. They either study hard to do better than their classmates or they take it easy because they do not believe they have a chance to win.

Teachers can also structure lessons individualistically so that students work by themselves to accomplish learning goals unrelated to those of their classmates. Individual goals are assigned each day, students' efforts are evaluated on a fixed set of standards, and rewards are given accordingly. Each student has a set of materials and works at his or her own speed ignoring the other students in the class. In an individualistic learning situation, students' goal achievements are independent; the goal achievement of one student is unrelated to the goal achievement of others. Students seek outcomes that are personally beneficial and they ignore as irrelevant the goal achievements of their classmates.

For the past 45 years competitive and individualistic goal structures have dominated Indian education. Students usually come to school with competitive expectations and pressures from their parents. Many teachers have tried to reduce classroom competition by switching from a norm-referenced to a criteria-referenced evaluation system. In both competitive and individualistic learning situations teachers try to keep students away from each other. "Do not copy", "Move your desks apart", and "I want to see how well you can do, not your neighbour", are all phrases that teachers commonly use in their classrooms. Students are repeatedly told: "Do not care about the other students in this class. Take care of yourself!"

When a classroom is dominated by competition, students often experience classroom life as a "rat race" with the psychology of the 100 yard dash. When a classroom is dominated by individualistic efforts, students will concentrate on isolating themselves from each other, ignoring others, and focusing only on their own work. Many students begin to compete within individualistic situations, even though the structure does not require it.

There is a third option. Teachers can structure lessons cooperatively so that students work together to accomplish shared goals. Students are assigned to small groups and instructed to learn the assigned material and to make sure that the other members of the group also master the assignment. Individual accountability is checked regularly to ensure all students are learning. A criteria-referenced evaluation system is used. In a cooperative learning situation students' goal achievements are positively correlated; students perceive that they can reach their learning goals if and only if the other students in the learning group also reach their goals. Thus, students seek outcomes that are beneficial to all those with whom they are cooperatively linked. Students discuss material with each other, help one another understand it, and encourage each other to work hard.

Cooperative learning is the most important of the three ways of structuring learning situations, yet it is currently the least used. In most schools, class sessions are structured cooperatively only for 7 per cent to 20 per cent of the time. Cooperative learning, however, should be used whenever teachers want students to learn more, like school better, like each other better, have higher self-esteem, and learn more effective social skills. The research indicates that classrooms should be dominated by cooperation among students (Johnson and Johnson, 1983). This is especially true when disabled students are being integrated.

### BASIC ELEMENTS OF COOPERATIVE LEARNING

The four basic elements that need to be included for small group learning to be cooperative include positive inter-dependence, individual accountability, collabo-

rative skills, and group processing. Each element contributes to effective use of cooperative learning in special education and integrated classrooms.

### *Positive Interdependence*

The perception that one is linked with others in a way that one cannot succeed unless the others do (and vice versa) and, therefore, that there work benefits one and one's work benefits them is referred to as positive interdependence. It is a sense of fate and mutual causation. The ways in which a teacher may structure positive interdependence include the following:

1. Positive goal interdependence exists when students perceive that the goal of the group is to ensure the learning of all group members. This may be done by giving each student an individual test and taking a group average for each member's grade or requiring one product from the group.
2. Positive reward interdependence exists when all group members receive a reward based on their overall achievement. Giving a single grade for the group's efforts, adding bonus points to each member's individual score when every member achieves up to criteria, or giving non-academic rewards such as free-time or food when all group members reach criteria are examples.
3. Positive resource interdependence exists when resources are distributed so that coordination among members is required if the goal is to be achieved. Jigsawing materials so that each member has part of a set of materials or information or limiting the resources given to the group (e.g. only one pencil, book, dictionary) is an example.
4. Positive role interdependence exists when members are given specific complementary roles to play in the group.
5. Positive task interdependence exists when a division of labour is structured so that the actions of one member have to be completed if the next group member is to complete his or her responsibilities.

### *Individual Accountability*

When the performance of each individual student is assessed so that the group knows who needs more assistance in completing the assignment and so that each member perceives that he or she must fulfill responsibilities in order for him or her and the group to be successful, individual accountability is being stressed. Giving individual tests on the material the group is responsible for learning and then averaging the group members' scores or randomly selecting one student's product to represent the entire group are common ways to ensure that individual accountability exists.

### *Collaborative Skills*

Groups cannot function effectively if students do not have and use the needed collaborative skills. These collaborative skills have to be taught just as purposefully and precisely as academic skills. Many students have never been required to collaborate in learning situations and, therefore, lack the needed social skills for doing so. Needed collaborative skills include leadership, decision-making, trust-building, communication, and conflict-management skills.

### *Group Processing*

Groups need specific time to discuss how well they are achieving their goals and maintaining effective working relationships among members. Groups need to describe which member actions are helpful and which are not helpful and make decisions about which actions to continue or change. Such processing enables learning groups to focus on group maintenance, facilitate the learning of collaborative skills, ensures that members receive feedback on their participation, and reminds students to practice collaborative skills consistently.

Some of the key ingredients to successful processing are allowing sufficient time for it to take place, making feedback specific, maintaining student involvement in processing, reminding students to use their collaborative skills while they process, and ensuring that clear expectations as to the purpose of processing have been communicated (Johnson and Johnson, 1984b).

## RELATIONSHIPS BETWEEN DISABLED AND NON-DISABLED STUDENTS

Considerable evidence exists that cooperative learning experiences, compared with competitive and individualistic ones, promote more positive relationships between disabled and non-disabled students (Johnson and Johnson, 1975, 1978, 1983, 1984c, 1985a; Johnson, Johnson and Maruyama, 1983). A recent meta-analysis reviewed all available studies comparing the three types of instructional situations on relationships among students (98 studies conducted between 1944 and 1982) found that these results held among disabled and non-disabled students, students from different ethnic groups, and homogeneous students (Johnson, Johnson and Maruyama, 1983).

The theoretical framework behind the meta-analysis provides a basis for some generalizations about cooperative learning where students participate in experiences designed to include mutual goals and responsibilities for learning. Disabled students are stigmatized and viewed by peers in negative and prejudiced ways. Physical proximity alone does not change this negative view. Non-disabled students may view their disabled peers more negatively or more positively. Whether

the relationships between disabled and non-disabled become more negative or more positive depends on how the teacher structures classroom learning. When learning situations are structured cooperatively, and disabled and non-disabled students work together in the same learning groups, then they interact in positive ways, feel supported and encouraged to achieve, gain an understanding of each other's perspectives, build a differentiated and realistic view of each other, accept themselves as their peers accept them, feel academically successful, and develop a positive relationship with each other. When learning situations are structured competitively or individualistically, disabled and non-disabled students do not interact with each other, feel disconnected and rejected by each other, are inaccurate in their perspective-taking, have monopolistic and oversimplified views of each other, have low self-esteem and are relatively unsuccessful academically, and have negative relationships with each other.

In addition to increased friendships and positive relationships between disabled and non-disabled students, cooperative learning experiences, compared with competitive and individualistic ones, promote a number of other instructional outcomes. Achievement as well as other less product-oriented variables (e.g. motivation, attitudes) have been effected.

#### *Achievement*

Students achieved more in cooperative than in competitive or individualistic learning situations. A meta-analysis of all the available relevant research studies (122 studies from 1924 to 1981) clearly indicated that cooperative learning experiences result in higher achievement and greater retention of learning than do competitive or individualistic learning (Johnson, Maruyama, Johnson, Nelson and Skon, 1981). The average student in a cooperative learning situation performed at approximately the 80th percentile of students in competitive and individualistic learning situations. This finding held for all age groups, ability levels, subject areas, and learning tasks. Students in cooperative learning situations tended to use higher level thought processes, engaged in more higher level oral rehearsal, and discovered higher level strategies more frequently than did students in competitive and individualistic learning situations.

#### *Motivation, Attitude and Other Cognitive Variables*

Cooperative learning experiences, compared to competitive and individualistic ones, promoted greater achievement motivation, more intrinsic motivation, more persistence in completing tasks, and greater continuing motivation to learn (Johnson and Johnson, 1985b). Cooperative learning experiences also resulted in more positive attitudes toward the subject area and instructor than did competitive and

individualistic learning experiences (Johnson and Johnson, 1983). In addition, after collaborating to complete joint tasks, most students perceive a system where group members are jointly rewarded as being fairer than a competitive or individualistic reward system.

Cooperative learning experiences resulted in higher levels of self-esteem, healthier processes for deriving conclusions about one's self-worth, and greater psychological health than did competitive and individualistic learning experiences. Compared with competitive and individualistic ones, cooperative learning experiences have promoted greater cognitive and emotional perspective taking. Competitiveness has been found to be related to egocentrism. Other collaborative competencies are stronger in cooperative learning environments as well. Employability rests to a great extent on the ability to work collaboratively with superior, colleagues, subordinates, and clients. Obviously students who have had extensive cooperative learning experiences have been found to have more interpersonal and small group skills than did students who have primarily experienced competitive and individualistic learning experiences. The ability to use one's knowledge and resources in collaborative activities with other people in career, family, community, and societal settings was found to be promoted by cooperative learning experiences.

## CONCLUSIONS

When disabled students are integrated into the regular classroom, the primary goal is to involve them in constructive relationships with non-disabled peers. When cooperative learning is emphasized, that goal is accomplished along with several other important instructional outcomes. With the amount of research evidence available, it is surprising that classroom practice is oriented toward individualistic and competitive learning. It is time for the discrepancy to be reduced between what research indicates is effective and what teachers actually do in practice.

### *The Teacher's Role in Implementing Cooperative Learning*

Implementing cooperative learning involves a structured, but complex, process. Teachers are encouraged to start small by taking one subject area or one class and using cooperative learning procedures until the process feels comfortable to them and then expanding into other classes. There are five major sets of strategies for structuring cooperative learning :

1. Clearly specifying the objectives for the lesson.
2. Making a number of decisions about placing students in learning groups before the lesson is taught.



3. Clearly explaining the task, the positive interdependence, and the learning activity in the students.
4. Monitoring the effectiveness of cooperative learning groups and intervening to provide task assistance (such as answering questions and teaching task skills) or to increase students' interpersonal and group skills.
5. Evaluating the students' achievement and helping students discuss how well they collaborated with each other.

The following discussion elaborates on these strategies and details a procedure from structuring cooperative learning. Specific examples of lesson may be found in Ghasnoff (1979), Lyons (1980), and Roy (1982). Two films are also available that demonstrate the use of cooperative learning procedure (*Belonging, Circles of Learning*).

### *Objectives*

Two types of objectives need to be specified before the lesson begins: (a) an academic objective specified at the correct level for the students and matched to the right level of instruction, and (b) a collaborative skills objective detailing what interpersonal and small group skills are going to be emphasized during the lesson. A common error many teachers make is to specify only academic objectives and to ignore the collaborative skills objectives needed to train students to cooperate with each other.

### *Decisions*

*Deciding on Size of Group.* Cooperative learning groups tend to range in size from two to six. When students are inexperienced in working cooperatively, when time is short, and when materials are scarce, the size of the group should be two or three. When students become more experienced and skillful, they will be able to manage larger groups. Cooperative learning groups have to be small enough so that every student has to participate actively. A common mistake is to have students work in groups of four, five and six before the students have the skills to do so competently.

*Assigning Students to Groups.* Teachers may wish to assign students to homogeneous or heterogeneous learning groups. When in doubt, teachers should use heterogeneous groups where students of different ethnic backgrounds, sexes, ability levels, and social classes work together. Teachers will want to take special care in building a group where students who have especial learning problems or who are isolated from their peers will be accepted and encouraged to achieve. Random assignment of students to groups is often effective.

*Planning How Long Groups Will Work Together.* Some teachers assign students to groups that last a whole semester or even a whole academic year. Other teachers like to keep a learning group together only long enough to complete one curriculum unit. In some schools students' attendance is so unpredictable that teachers form new groups each day. Sooner or later every student should work with every classmate.

*Arranging Room.* Members of a learning group should sit close enough to each other that they can share materials and talk to each other quietly and maintain eye contact with all group members. Circles are usually best. The teacher should have a clear access lane to every group. Common mistakes that teachers make in arranging a room are to place students at a rectangular table where they cannot have eye contact with all other members or move several desks together, which may place students too far apart to communicate quietly with each other.

*Planning to Promote Interdependence.* Instructional materials need to be distributed among group members so that all students participate and achieve. Especially when students are inexperienced in collaborating teachers will want to distribute materials in ways planned to communicate that the assignment is a joint (not an individual) effort and learning situation. Materials can be arranged like a jigsaw puzzle so that each student has part of the materials needed to complete the task. Giving on copy of the materials to a group ensures that the students will have to work together.

*Assigning Rules.* Cooperative interdependence may also be arranged through the assignment of complementary and interconnected roles to group members. Such roles include a summarizer (who restates the major conclusions or answers at which the group has arrived), a checker (who ensures that all members can explain an answer or conclusion), an accuracy coach (who corrects any mistakes in another member's explanations or summaries), and an elaboration seeker (who asks other members to relate material they previously learned). Assigning students such roles is an effective method of teaching them collaborative skills and fostering interdependence.

*Explaining the Cooperative Goal Structure and Academic Task.* Teachers clearly explain the task so that students are clear about the assignment and understand the objectives of the lesson.

*Structuring Positive Goal Interdependence.* Teachers communicate to students that they have a group goal and must work collaboratively. This may be done by asking the group to produce a single product or report, providing group rewards, giving bonus points if all members of the group reach the preset criteria of excellence, or picking a student at random to represent the group and explain its conclusions to the class. In a cooperative learning group, students are responsible for learning the assigned material, making sure that all other group members learn

the assigned material, and making sure that all other class members complete the assignments, in that order.

*Structuring Individual Accountability.* The purpose of a learning group is to maximize the learning of each member. Lessons need to be structured so that the level of each student's learning is assessed and that groups provide members with the encouragement and assistance needed to maximize performance.

*Structuring Inter-group Cooperation.* The positive outcomes found within a cooperative learning group can be extended throughout a whole class by structuring intergroup cooperation. Bonus points may be given if all members of a class reach a preset criteria of excellence. When a group finishes its work, the teacher should encourage the members to go help other groups complete the assignment.

*Explaining Criteria for Success.* Evaluation within cooperatively structured lessons needs to be criteria-referenced. At the beginning of the lesson teachers need to explain clearly the criteria by which students' work will be evaluated.

*Specifying Desired Behaviour.* The work cooperation has many different connotations and uses. Teachers will need to define cooperation operationally by specifying the behaviours that are appropriate and desirable within the learning groups. Beginning behaviours are "stay with your group", "use quiet voices" and "take turns". When groups begin to function effectively, expected behaviours may include having each member explain how to get an answer and asking each member to relate what is being learned to previous learning.

*Monitoring Students' Behaviour.* The teacher's job begins in earnest when the cooperative learning groups begin working. Much of the teacher's time is spent observing group members to see what problems they are having completing the assignment and working collaboratively. Many teachers also use student observers to gather information on the appropriateness of activities within each group.

*Providing Task Assistance.* In monitoring the learning groups as they work, teachers will wish to clarify instructions, review important procedures and strategies for completing the assignment, answer questions, and teach task skills as necessary.

*Intervening to Teach Collaborative Skills.* While monitoring the learning groups, teachers often find students who do not have the necessary collaborate skills and groups where members are having problems in collaborating. In these cases, the teacher should intervene to suggest more effective procedures for working together and more effective behaviours in which students should engage.

*Providing Closure to Lesson.* At the end of each lesson, students should be able to summarize what they have learned. Teachers may wish to summarize the major points in the lesson, ask students to recall ideas or give examples, and answer any final questions students have.

*Evaluating Students' Learning.* Students' work is evaluated, their learning assessed, and feedback is given to them as to how their work compares with the criteria of excellence. Qualitative as well as quantitative aspects of performance should be addressed.

*Assessing How Well Group Functioned.* The learning groups assess how well they worked together and plan how to improve their effectiveness in the future. A common error of many teachers is to provide too brief a time for students to process the quality of their collaboration.

### *Integrating Disabled Students into Cooperative Learning Groups*

When disabled students are integrated into cooperative learning groups, there are sometimes student anxieties and concern that teachers need to respond to so the process runs more smoothly and is more effective. Careful attention to positive interdependence, individual accountability, collaborative skills, and group processing usually solve such problems. Three of the most common problems are the disabled students being fearful and anxious, the non-disabled students being concerned about having their grades affected, and the disabled students being passively uninvolved. Methods for dealing with such problems have been identified and practiced in successful programmes.

*Anxious Disabled Students.* Many disabled students may be fearful and anxious about participating in a cooperative learning group with non-disabled peers. Their anxiety may be alleviated through the following actions :

1. Explain the procedures the learning group will follow.
2. Give the disabled students a structured role so that they understand their responsibilities. Even if a student cannot read, he or she can listen carefully and summarize what everyone in the group is saying, provide leadership help to keep the group's work organized and so forth. There is always some way to facilitate group work, no matter what disabled a student may have.
3. Enlist the aid of a special education teacher to coach the disabled students in the behaviours and collaborative skills needed within the cooperative group. Pretraining in collaborative skills and periodic sessions to monitor how well the skills are being implemented will increase the disabled student's confidence.
4. Enlist the aid of a special education teacher to pretrain the disabled student in the academic skills needed to complete the group's work. Try to give the disabled student a source of expertise the group will need.

*Anxious Non-disabled Students.* Many non-disabled students may be concerned that the disabled student will lower the overall performance of their group. The three major ways of alleviating their concern are as follows :

1. Train non-disabled students in helping, tutoring, teaching, and sharing skills. The special education teacher may wish to explain to the group how best to teach the disabled group member. Many teaching skills, such as the use of praise and prompting, are easily taught to students.
2. Make the academic requirements for the disabled students reasonable. Ways in which lessons can be adapted so the students at different achievement levels can participate in the same cooperative group are to :
  - a. Use different criteria for success for each group member,
  - b. Vary the amount each group member is expected to master.
  - c. Give group members different assignments, lists, work, or problems and then use the average percentage worked correctly as the group's score.
  - d. Use improvement scores for the disabled students. If it is unclear how to implement these procedures, consult with the special education teacher to decide what is appropriate for the specific disabled student.
3. Give bonus points to the groups that have disabled members. This will create a situation in which non-disabled students want to work with their disabled classmates to receive the bonus points.

*Passively Uninvolved Disabled Students.* When disabled students are turning away from the group, not participating, not paying attention to the group's work, saying little or nothing, showing no enthusiasm, or not bringing their work or materials, the teacher may wish to :

1. Jigsaw materials so that each group member has information the others need. If the passive uninvolved student does not voluntarily contribute his or her information, the other group members will actively involve the student.
2. Divide up roles and assign the passive uninvolved student one that is essential to the group's success.
3. Reward the group on the basis of their average performance, which will encourage other group members to devise strategies for increasing the problem member's involvement.

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## Book Reviews

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### Creativity and Personality

Akhil Anand Pathak

Amir Prakashan, Delhi, 1989, pp. 135, Rs 125.00

CREATIVITY has been defined variously, but with the same conclusions. It consists in uniqueness. It moves away from the beaten path, from responses already known, defined and expected. It is thinking in different directions. Creativity suggested almost freedom of human thought. The creative individual is free to choose any path that is open to him. It is viewed as involving the production of as many answers as possible to a given problem. In a particular given situation, the creative individual may behave in his own way which is different from his fellow beings and, thus, leaves a stamp of the individual. Creativity is sharply distinguished from stereotyped behaviour. Creative products are novel constructs. This novelty is a result of the uniqueness of the individual in his interaction with the materials of his experience. The uniqueness, novelty or originality of creativity is evident from the creative works of artists, scientists, musicians, painters, and the like.

The book under review is the product of the author's doctoral work on "A Study of Some Personality Factors and Value Orientation of Creative Individuals", submitted to Magadh University, Bodh Gaya.

The author has tried to explain the relationship of creativity and intelligence. There are two modes of intellectual operation—convergent thinking and divergent thinking. Convergent thinking suggests the conventional type of intelligence

which emphasises narrowing down the possibilities of the production of answers to a given problem. It proceeds towards one right answer, or one that is more or less clearly demanded by the given information. Divergent thinking emphasises researching activities with the freedom to go in different directions. It involves diversified generation of as many answers as possible. It is always multi-directional. Convergent thinking centres round logical possibilities. One reconstructs the past while the other initiates the new. Thus, creative students in comparison with intelligent students have something else and something more to show.

In the present investigation, an attempt has been made to delineate the personality factor and value orientations of creative individuals and in doing so, creative individuals would be classified into four groups, based on their joint standing on their creative index and intelligence scores. The four groups would be, High Creative-High Intelligence, High Creative-Low Intelligence, Low Creative-High Intelligence and Low Creative-Low Intelligence. The classification of creative individuals into four groups has been necessitated by the reflection of intimate interaction between creativity and intelligence and this led to a consideration of intelligence as a suppresser variable.

The author has laid sufficient emphasis on the review of earlier studies. These are mainly concerned with personality, adjustment and value orientations together with some background factors as related to creativity. The author has tried to mention various studies under different heads, viz. creativity and personality, creativity and adjustment, creativity and value orientations, creativity and background factors. Various factors, i.e. sex, SES, race, caste, etc. have been examined in relation to the creativity index of students.

The purpose of the study which means to explore some personality factors and value orientations of creative individuals has also been given. To achieve this end, the various hypotheses were framed in order to nurture the objectives of the study.

The next step deals with the method of the study, selection of the sample, the tests used and administration of the tests. Incidental sampling technique was used, keeping in view the various limitations and certain practical considerations. The sample consisted of 400 college freshmen, drawn from three different colleges in Barh subdivision in the district of Patna. For the collection of data, appropriate tests were administered to the sample by the author. For measuring creativity, Wallach Kogan's Battery of Creativity Instrument, Catluk's 16 P.F. (Form A) as adapted by Kapoor (1970) for personality measurement were used. In order to determine adjustment and values, Adjustment Inventory by Sinha and Singh and Allport, Vernon, Lindzey's study of values as adapted by Verma (1970) were used. In addition to this, some background factors were also elicited, i.e. ordinal position, parent's income, courses of study (science, humanities, arts) caste and



parent's position. The sample used in this study was fairly small which may affect generalization.

The fifth chapter is concerned with the result of the investigation. At the end of the book a list of selected bibliography is given. This adds to the usefulness of the publication for the research scholar. The present book is appreciable work in the field of education and psychology and is very useful to researchers, teacher-educators and psychologists.

ASHOK KUMAR



### **The Economics of Education: Theoretical Analysis of Investment and Development Perspective**

V.P. Garg, Metropolitan Book Co. Pvt. Ltd., 1989, pp. 153, Rs 150.00

**T**HAT investment in men rather than machines is a better proposition has been realized by growth economists and educational planners and the Human Capital Theory has been advanced during the 1960s and 1970s. It was argued that expansion of education would increase productivity and social equity and reduce economic and social disparities. It is in this context that the subject of Economics of Education branched off as 'normative science' with potential for further investigation. Since the 1960s, the field has been investigated and much substance has been added.

The book under review makes an attempt to present the major thrust areas and content analysis in Economics of Education. The subject matter is presented in the book in ten chapters containing critical aspects of Human Capital Model with its critique, cost analysis and economics of financing education, budgetary reforms,

monitoring and evaluation, educational planning and the various approaches adopted in educational planning. The ramifications of these approaches have been critically examined. At the end, in chapter ten, Indian researches in the field of Economics of Education have been reviewed and research gaps identified. An attempt has been made in each chapter to develop formulations and conclusions on research studies.

Addressed to research scholars, educational administrators and planners who wish to advance their knowledge in this emerging area, the book covers broad areas of Economics of Education and serves as a 'compendium' from the standpoint of both theory and practice. Illustrations have been drawn from empirical data. Wherever necessary, Indian studies in the field have been quoted. The subject matter is presented in a manner so as to provide updated theoretical analysis and elucidation of the field, with emphasis on relevance and usefulness of the analysis to developing countries like ours. A study of the book is expected to stimulate the reader to think critically about the *suo moto* relationship of investment in education and human resource development. The book comes handy to students of Economics of Education as it presents in a concise form the theoretical and practical aspects of the subject. Great care could have been taken to avoid the numerous printing errors and to make the price more reasonable.

V. RAMACHANDRA RAO

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## **An Innovative Social Studies Curriculum in Canada: An Experiment**

(DR) HARRY DHAND  
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**I**N this new era of challenge in social studies many exciting, innovative practices and trends are underway. Any account of them will, at best, be highly subjective and probably incomplete in as much as that which is taken for an innovation by one person may appear just ephemeral to another critic. To some these innovations and trends may not be new at all as most of them have their roots in the past. However, it may be worthwhile to survey<sup>5</sup> and summarize major trends and innovative practices in social studies education in Canada and the USA to set the

stage. This will also provide the "state of the art" in social studies education in North America.

1. Social Studies programmes in North America contain a variety of rationales. "If there is a trend in the area of rationale building, it is the continued focus on citizenship education" (Stanley, 1985). The social roles (citizen, worker, consumer, family member, friend, member of various social groups, and self) approach reflects a genuine effort to create a comprehensive, mainstream rationale for social studies. The underlying principle of the social roles approach is the development of students who will become knowledgeable and effective social participants (Superka and Hawke, 1982). However, the debate over the rationale for social studies continues.
2. There is concern over the fact that social studies lacks a set definition. Even today social studies appears to be in a state of turmoil.
3. Citizenship education is considered to be a primary goal for social studies. Although the social studies teacher would not be held solely responsible for citizenship education, social studies offers a unique contribution to this function. The most common set of goals consists of (a) knowledge, (b) skills, (c) attitudes/values, (d) social participation.
4. The most used item among curriculum materials is the textbook. In spite of its faults the textbook is improving graphically and pictorially. There is an increasing amount of improvement in the treatment and presentation of minorities. The findings of Project SPAN (1987) include: the individual teacher is seen as a "key" element of the learning process but no one is sure why or how; the most commonly perceived problem in the social studies classroom is poor reading abilities; teachers are beginning to teach social studies in diverse ways; most social studies instruction is done in large groups leaving little time for individual attention, teachers spend little time contemplating the goals of their activities as there is a predominant preoccupation with administrative details.
5. There appears to be a special emphasis on "cultural literacy". "Cultural literacy" is the firm grasp of background information that writers and speakers assume their readers and audience already possess. It is considered by many to be the key to effective, successful education in North America. Relevant American and Canadian surveys indicate that there exists gaps in American and Canadian students' basic knowledge of social studies, geography, history, literature, politics and democratic principles (Hirsch 1987, and Dhand 1989).
6. It is also useful to keep in mind the five major trends in Canadian social studies education outlined by Baumgardner (1985). Those are:
  - (a) Conceptual Approach

- (b) Interdisciplinary Approach
  - (c) Inquiry
  - (d) Values Education
  - (e) Multiculturalism
7. We can also see the growing emphasis placed on consumerism, environmentalism, globalism, sexism, peace education, legal education, co-operative studies, native studies, women studies and local studies. These "isms" and "studies" and other new content initiatives form an important and welcome addition to social studies programmes. The new topics are not only interdisciplinary and issue-centred but also interesting and relevant to students. They create additional opportunities to use meaningful content to teach basic skills, concepts, and generalizations. Some educators, on the other hand, may see them simply as add-ons to an already crowded social studies curriculum.
8. Some significant practices and trends in social studies education continue to be the focus of many educators. Again there is no overall consensus concerning these practices nor are there any foolproof answers. These trends, though repetitive, are summarized by Dhand (1989) below:
- (a) There is a growing movement towards humanistic methods of classroom teaching.
  - (b) Ethnic pluralism has become a legitimate, viable and integral part of social studies education.
  - (c) Ethnic pluralism has brought with it direct implications for the success of many of the goals of social studies (i.e. citizenship).
  - (d) Education for global perspectives has become a popular goal for many social studies teachers.
  - (e) There is growing controversy over the usefulness of the textbook.
  - (f) The questions of who will develop curriculum and materials, where the money will come from and how research should be conducted remain for the most part unanswered.
  - (g) There has been a tendency to realize the need for improved teacher education. There is debate, however, concerning the nature of pre-service and inservice education.
  - (h) There has been a growing need to utilize the tools of our technological world such as computers and television in the social studies classroom.
  - (i) The role of the teacher has begun to change as greater emphasis has been placed on critical thinking, process skills and controversial issues.

- (j) The "Back to Basics" movement has also had an impact on social studies.
  - (k) Futuristic studies have gained popularity. The question remains, however, as to how much past, present and/or future information should be included.
  - (l) There is still debate over how much local, provincial, national and/or international material should be included.
9. A recent national survey conducted in the United States resulted in a number of generalizable statements concerning the status of social studies (Dhand, 1989).
- (a) The "flavor" of social studies is highly prescriptive.
  - (b) Major changes in requirements and recommendations for pre-service training, certification and inservice assessment have begun.
  - (c) There is a growing trend toward increased graduation requirements.
  - (d) The duties and influence of social studies "specialists" vary greatly.
  - (e) Recent trends in social studies are toward tighter requirements for teachers, students and curricula.
10. Morrisett (1982) suggests that the following points characterize the *present* and *future* status of social studies education:
- (a) The Inertia of the Past will Prevail: The struggle for educational reform will remain constant but, without the necessary support system, the future state of social studies will probably remain as it is today.
  - (b) Education will move, slowly but surely — and may be not so slowly to agree upon ideal states: Educators will put into practice the storehouse of knowledge they possess about education and learning. Students will become more active in the learning process, there will be more individualized instruction, there will be a noticeable decrease in rote learning and an increase in problem solving.
  - (c) The New Social Studies is not "Dead but only Sleeping": Many new materials which presently gather dust in publishers' offices will begin to appear in classrooms.
  - (d) A Revolution Requires a Strong Catalyst: Computers may be it: Computers may offer solutions to the many educational problems which impede effective learning. For example, computers aid in individualized instruction, interactive learning, manipulative learning and visual learning. Computers decrease administrative time for teachers and increase the possibilities for diversity in teaching.



## MIDDLE SCHOOL SOCIAL STUDIES IN SASKATCHEWAN

Social Studies education in Saskatchewan has been at the centre stage of controversy because of the proposed introduction of new courses in the middle school (Division III) and the ensuring major modifications and changes in other divisions in the coming years. This controversy in social studies is likely to increase due to its potential significance to the core curriculum and far-reaching implications and repercussions of that curriculum on the preservice and inservice education of social studies teachers.

### *Framework for Social Studies K-12*

The Social Studies Task Force (1982) made recommendations with regard to a comprehensive definition, objectives, content, methods, materials and inservice education for K-12 social studies curriculum in Saskatchewan. Following the Social Studies Task Force, the Minister of Education's Social Science Reference Committee (1983), suggested a rationale and themes for a grade 1-12 social studies programme and also drew guidelines for content selection, instructional methodology and an interdisciplinary curriculum. The committee suggested that history should be included, but it ought to be included within the broader framework of social studies which incorporates other social sciences such as geography, sociology, political science, economics and psychology. If defined social studies as the study of people and their relationship with their social and physical environments which could provide the learner with the knowledge, skills and values necessary for effective participation in society.

As a result of a most comprehensive review of education in Saskatchewan social studies has become one of the seven required areas of study within a new core curriculum. The core curriculum became effective in the fall of 1988. Common essential learnings such as communication, numeracy, critical and creative thinking, technological literacy, independent learning, and personal and social values and skills are being incorporated into all the required areas (*Directions* 1984). These emphases have far-reaching repercussions for the new social studies programme.

### *Middle Years Social Studies*

It is in this context that Saskatchewan, for the first time, has developed a comprehensive 1-12 social studies, three-phased curriculum development and implementation plan with a conceptual framework common to all courses. To accomplish this, a conceptual framework consisting of twenty concepts (such as causality, change, culture, power and values) has been created to form the basis for

content selection and course development. The first phase is the development of Middle Years Social Studies Curriculum. The grade 8 course, "The Individual in Society", is presently in its first year of implementation. The grade 7 course, "Canada and the World Community", has been implemented in the fall of 1988. The grade 9 course, "Roots and Society", was then taken up for revisions, for implementation in the fall of 1990.

### *Major Goals*

The major goals of the social studies new courses in the middle school in Saskatchewan are:

1. To develop knowledge and cultural understanding incorporating learning from history, geography and other humanities and social sciences.
2. To develop democratic understanding and values, including understanding of national identity and personal identity, citizenship rights and responsibilities, understanding of communication problem with a complex set of choices and decisions.
3. To develop the ability to identify and analyze problems and issues which affect us as members of a changing and complex world.
4. To develop skills and social participation which will include basic study skills, critical thinking skills, problem-solving skills and decision-making skills.

These goals are translated into more specific and achievable learning objectives under three subheadings: knowledge, skills and values. It appears that learning objectives created for these courses are appropriate, coherent, meaningful and comprehensive.

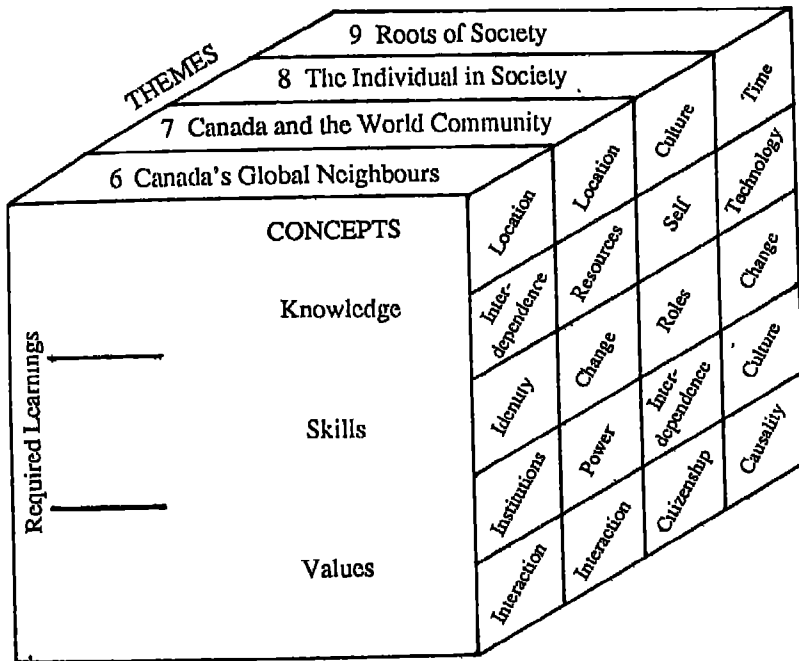
### *Chief Characteristics*

1. *Conceptual Approach:* A conceptual framework consisting of twenty concepts has been constructed to form the basis for the selection of content and course development. Each grade emphasizes certain concepts within the context of a theme for a particular grade. The degree of concept complexity as well as abstraction increases at each grade level. Thus a great deal of attention is paid to the following twenty concepts than to facts and endless information in the area of social studies.

Concepts				
Beliefs	Culture	Environment	Interdependence	Resources
Causality	Decision-making	Identity	Needs	Technology
Change	Distribution	Institution	Location	Time
Conflict	Diversity	Interaction	Power	Values

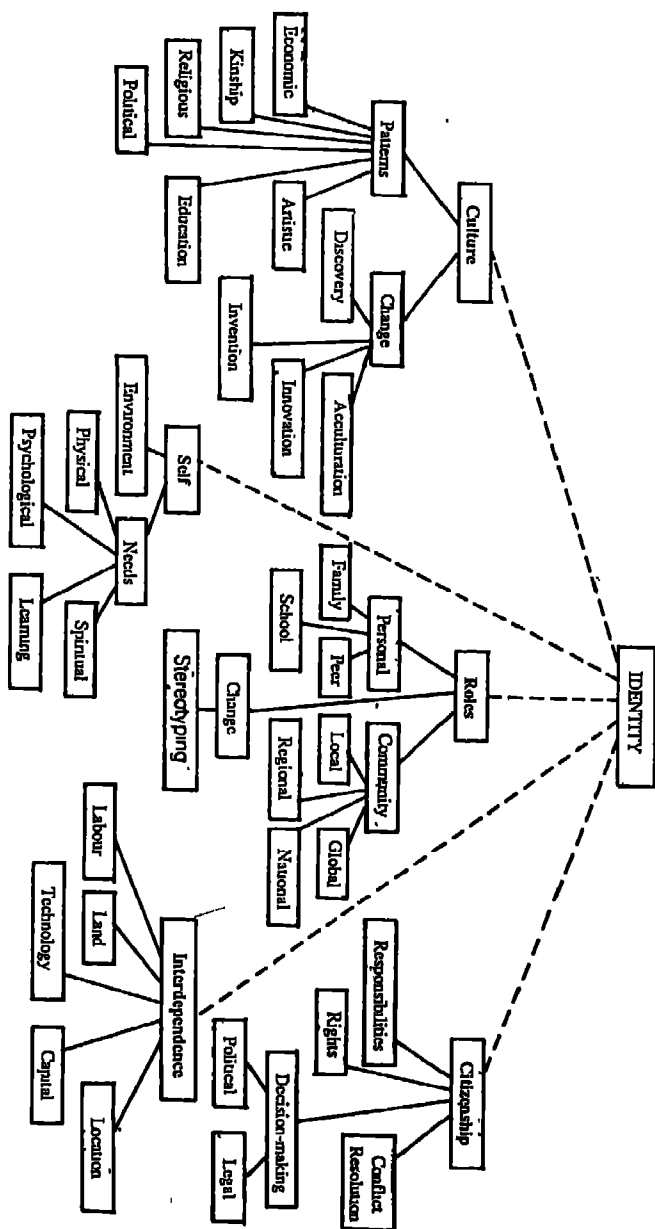
## AN INNOVATIVE SOCIAL STUDIES CURRICULUM IN CANADA

A three-dimensional curriculum model was created to keep a balance and coherence in determining appropriate content selection, concept emphasis and skill development for all courses.



Curriculum Structure: Middle Years

Concept teaching through various strategies is emphasized. A conceptual map, like the following, is provided for each grade level.



Conceptual Map: The Individual in Society

2. *Inquiry Orientation*: Inquiry is the heart of new courses in the social studies in the middle school. A glance at the teaching strategies such as role playing, case studies, interviewing, surveying, group work, field trips, brainstorming and concept teaching (Saskatchewan Education 1985) reveals that students

- (a) actively participate.
- (b) carry out systematic investigations.
- (c) are involved in critical thinking, problem-solving, decision-making and Common Essential Learnings.
- (d) act as social scientists.
- (e) explore/reach higher levels of thinking.

3. *Interdisciplinary*: Courses draw *directly* concepts/content from social sciences such as history, geography, economics, political science, sociology, anthropology, psychology, the humanities, and *indirectly* other areas.

4. *High Adaptability and Flexibility*: They are built into courses. The content can be combined with other content, can be modified or adapted according to the learning styles, student abilities, availability of resources, the nature of community or other local conditions. The courses are purported to be sensitive to the individual differences in students.

5. *General*: Curriculum is based on such principles as spiral-experiential sequence and expanding horizons. Curriculum is expected to cover Canadian perspective as well as Saskatchewan point of view where applicable. Independent research and library skills, a variety of instructional materials including community resources, extensive use of case studies and valuing strategies are highly visible in the curriculum.

6. *Innovative Process of Development*: The unique and innovative process which has broken new ground for curriculum development in Saskatchewan was initiated, developed and followed. Some of the unique elements, though they have roots in the past, are highlighted below:

- (a) Needs assessment was completed before the initiation of the process.
- (b) The curriculum was developed in the light of the recommendations of the Social Studies Task Force and the blueprint provided by the Social Sciences Reference Committee. The curriculum benefited from the unique public input from individuals and groups who traditionally have not had an opportunity to do so.
- (c) The Social Studies Curriculum Advisory Committee (the watch-dog committee) in keeping with the spirit of *Directions* (1984) and other reports supervised the progress of the Project Team, Writer/Developer, Middle Years Social Studies Sub Committee, Social Studies Contact People, Social Studies Materials Evaluator and Writers of Activity Handbooks.

- (d) The curriculum was field tested from the early drafts to the final products. Even early drafts of textbooks were field tested. A large amount of data in terms of feedback was considered in the revisions. In some cases 4-6 revisions were normal.
- (e) Another break in the tradition, and an innovative aspect in the curriculum, is what Saskatchewan Education provides to the busy teacher:
  - (i) *Curriculum Guide* which includes rationale, conceptual framework, skill charts, topics, themes, goals and units, glossary, concepts and definitions.
  - (ii) *Teachers' Activity Guide* which complements the *Curriculum Guide*. It provides a variety of activities on each unit in detail.
  - (iii) *Teaching and Evaluation Strategies* provides teachers at all levels with a number of methods of delivering and evaluating the curriculum.
  - (iv) A multimedia *Bibliography* which represented a selected listing of materials evaluated by Saskatchewan educators as appropriate for support of the new curriculum.
  - (v) A textbook commissioned, field tested to a large extent, developed and written by a Saskatchewan writer (or writers) is provided. The textbook includes a variety of readings, case studies, skill boxes, question boxes, a glossary and a variety of illustrative material.

#### ANALYSIS OF THE CURRICULUM

The review of current literature in social studies education and curriculum development reveals certain "less desirable" and "more desirable" characteristics of social studies programmes. Those characteristics are given in the following chart:

CHARACTERISTICS OF SOCIAL STUDIES PROGRAMMES	
<i>Less Desirable</i>	<i>More Desirable</i>
1. Priority given to Western culture/civilization at the neglect of Non-Western world.	1. More comprehensive world view with equal emphasis on Western, Non-Western and Christian, Non-Christian cultures.
2. Emphasis on memorization of facts.	2. Emphasis on open-ended questions, critical thinking and problem-solving.
3. Too much emphasis on history and geography.	3. Programme based on interdisciplinary approach drawing from social sciences, humanities and student experiences.

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|--|---|
| 4. Emphasis on 'fact-finding and textbook teaching.  | 4. Emphasis on concept development through multiple and perhaps unconventional resources.   |
| 5. Formal programmes with little flexibility for student involvement.  | 5. Informal programme with a more relaxed atmosphere with greater emphasis on student participation and involvement.  |
| 6. Values education through rigid inculcation and/or indoctrination.   | 6. Emphasis on value clarification and value analysis.  |
| 7. Little emphasis on getting students to think. Critical thinking is not a major objective.                         | 7. Emphasis on critical thinking and inquiry.   |
| 8. Little or no emphasis on inquiry or decision-making.  | 8. Development of the skills of inquiry, decision-making and problem-solving is a fundamental objective.  |
| 9. Racial and sex-role stereotyping ignored. Multiculturalism based on the "melting pot" idea.                       | 9. Greater attention paid to sexism, sex-role stereotyping and racial stereotyping. Emphasis on multiculturalism and pluralism. Some attention to the role of women and minorities. |
| 10. Emphasis on overviews and survey of large areas of study.  | 10. Specifics are considered and learning is generalized so it can be applied to various situations.  |
| 11. Little or no connection made between social studies programme and real life.                                     | 11. Social studies content is applied to real life.   |
| 12. Little or no focus on futurism. Impact of technology and science on human life ignored.                          | 12. Changes arising from advancements in science and technology are considered. Some attention is being given to futurism.  |
| 13. Too much credit given to the "authority" of the written text. Little credit given to student ideas and opinions. | 13. Broadening the tools of learning beyond the textbook. Students are encouraged to share their ideas and opinions.  |
| 14. Little emphasis on problem-solving.  | 14. Greater emphasis put on problem-solving.  |

15. Little or no focus on current events and world affairs.	15. Current events and world affairs are an important part of the social studies programme.
16. Little consideration for global education. Peace education not in the programme.	16. Global and peace education is given consideration.
17. Few options for teachers: rigid programme design, few teaching materials.	17. A flexible programme design and a variety of teaching materials and strategies is available.
18. Programme not field-tested before implementation.	18. Programme field-tested, revised a few times and improved.
19. Usually isolated from other subjects.	19. Build bridges to other subjects.
20. Mostly classroom-confined activities.	20. Moving a substantial proportion of educational activities out of the classroom and into the library, the school and the community. Give students freedom.
21. Partial participation of teachers in the curriculum development process.	21. Full participation of teachers in every phase of the curriculum development process.

The new Social Studies (Division III) Curriculum rates very high on the "more desirable" side, if the above guidelines given in the chart are applied. These guidelines were helpful in examining and assessing the new curricula. As a cautionary measure, it must be pointed out that this is not a formal content analysis or value analysis of the current curriculum.

## PROBLEMS

The introduction of the new curriculum, especially the initial draft for grade 9 sparked a great deal of controversy in the media, professional meetings, university and political channels. Critics have labelled the grade 9 course (Roots of Society) in the media as "unteachable and unlearnable", "lacking in historical context and content", and "mountain of material from all over the world and all over time, material that is unfocussed and out of sequence". More importantly, there is concern expressed that curriculum decisions are becoming much more subject to political influence than to educational influence (Crozier-Smith, 1989).



Despite the controversial nature of the curriculum, it is being received positively in the province. One grade 7 teacher said, "For years I taught my students to memorize the textbook. I lectured to them far too much. Because of the new curriculum, I have completely changed my teaching methods. The students are learning more and seem to like social studies better". It is hard to judge from the single statement but if the new curriculum stimulates teachers to improve their teaching, then the efforts to change the curriculum have been worthwhile (Schaller, 1989).

Indubitably, the process of curriculum development of social studies for the middle school has been the most comprehensive, innovative and current in the history of curriculum development in Saskatchewan. Unfortunately, many problems continue to concern social studies teachers and educators and, perhaps, will affect the implementation of the new curricula. The most obvious problems are: the controversial nature of the courses, their lack of historical content, lack of sufficient and rigorous evaluation of pilot and field trials and lack of adequate funds for materials, resources, and inservice teacher education. Other factors hampering the effective use of new programmes include the inadequate breadth and depth in the preparation of teachers in the social sciences, the low priority given to social studies in the schools, the lack of frontier thinking in teaching, the lack of student interest and the stark realities of increasing multi-grade classrooms in rural Saskatchewan. Hopefully however, these problems are solvable and the new developments will change the direction of Saskatchewan Social Studies education.

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# Teaching of Mathematics: Effectiveness of Computer-Assisted Instruction (CAI) and Conventional Method (CM) of Instruction

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THE use of computers in education is a new innovation which has attracted the attention of practitioners and researchers. To be precise, the recent revolution

in microcomputer technology has perhaps affected educational system, business, communication, transport and industry not only in the developed countries of Western Europe, the United States of America and Japan but also in developing countries. Some research studies in the developed countries have examined the impact of computer in education and a few recent studies have reviewed the impact of Microcomputer Assisted Instruction (hereafter identified as CAI) on mathematics learning.

The growth of computers after the World War II was very rapid and this development took place in five distinct phases known as computer generations—1st generation: Thermionic Valves—1950; 2nd generation: Transistors—1960; 3rd generation: Integrated Circuits—1965 (Mini Computers); 4th generation: Microprocessor Chips—1975; and 5th generation: Large Scale Inference System—1980. The fourth generation of computers is the generation of microcomputers. These computers used microprocessors chips. Being handy and cheap, microcomputers have played a very significant role as an educational tool in the school education. In fact, computer-assisted instruction now-a-days means micro-computer-assisted instruction.

Microelectronics, the silicon chip technology which has made cheap micro-computer possible, has given a new shape to educational technology in all disciplines. The major influence of technology on mathematics education has been observed in its potential to shift the focus of instruction from an emphasis on manipulative skills to an emphasis on developing concepts, relationship structures and problem-solving skills.

As the teaching of mathematics at the school level through the Computer Assisted Instruction method has been a focus of attention in many countries across the world for the past several years, many research works and studies have been carried out on CAI effectiveness. Long-term studies of the effectiveness of micro-computer-assisted instruction are obviously not available but short-term studies at the national and international levels are numerous. It seems proper to review the results of some such recent studies. Grady (1986) has reported the work of Carrier in her dissertation. Carrier (1985) has reported that the results of some short-term studies are inconclusive. She further reports a study by Edwards, Norton, Taylor, Weiss and Van Dusseldorp (1975) which established when CAI was used as a substitute for traditional instruction. Collenback (1982) reported that no evidence was found to support the conjecture that subjects with computer programming experience, outperform those with no such experience in problem-solving situations. Wright Pamela (1983) conducted a study on CAI for remediation in mathematics on the secondary level and found that CAI produced significantly higher achievement as compared to conventional classroom instruction in particular classrooms in two selected schools. Abraham Sandma (1984) proved that the

results for criterion reference mathematics test showed that all the CAI students scored higher than the control group students, when the study was conducted to measure the effect of CAI of grade I phonics and mathematics achievement. Sasser, John Ester (1984) reports that when the study investigated the relationship between methods of CAI in mathematics and in learning modality preferences of students, it was concluded that the CAI group achieved significantly higher gain scores than the visual tutorial group. Levy, Max Hensy (1985) revealed that there was significant gain for the CAI group for learning mathematics, when the study was conducted on the evaluation of CAI upon the achievement of grade V students by the standardised tests. Grady (1986) reported that computer-based instruction, used for specifically selected topics for which quality software was available, and with effective support from teachers, had significant impact on students' achievement in mathematics. In this way the review of the results of some recent studies the international level, makes it evident that the effectiveness of CAI in terms of student performance continues to be a controversial matter and its cost-effectiveness is as yet unproven.

Computerization in education is in its infancy in India. As long ago as 1955, the first computer HEC-2M, which was imported from the UK, was installed at the Indian Statistical Institute, Calcutta. In course of time, the first indigenously designed computer system was installed at Jadavpur University, Calcutta in 1964. During the 1982 Asian Games and 1983 Non-Alignment Meet held in New Delhi, computers were successfully employed. Since then, computers have been installed at many places in the country. A number of regional computer centres have also been established in various cities. Progress was very slow because the large main-frame computers, then available, were extremely expensive. It is since last decade or so only that low-priced micro-computers have been manufactured on a large scale in the West and subsequently imported by India. In 1985 about 10,000 microcomputers were installed in the country, which was five times the number installed in 1984. It was estimated that more than one lakh computers would be installed in the country by the year 1990. At present there are a few centres in India where computers have been installed for some specific purposes such as data processing for research, decision-making and maintaining students' record. There have been some interesting developments with regard to the use of microprocessors for formation of the scripts of a few Indian languages such as Tamil, attempts at machine translation, etc. at such institutions as the Tata Institute of Fundamental Research and the Indian Institute of Technology, Madras. Educational technologists in India should not shy away from computers anymore because at the turn of the century it is estimated that there might be as many chips as people.

A pilot project called Computer Literacy and Studies in Schools (CLASS) was launched in June, 1984 as the first step in promoting the use of microcomputers in

Indian secondary schools. Since then, the micro computer revolution has been rapidly gaining impetus in Indian schools through the CLASS project. No longer a novelty, micro computer is becoming a familiar classroom tool in Indian schools.

When a third world country like India, where more than 42 per cent elementary schools are deprived of chalkboard facilities, decides to go for computers on a large scale using them as teaching tools in the schools, there are many aspects to be looked into. Identification of threats and challenges in the use of computers in schools is of prime importance. It has been rightly reiterated (SEAMEO, 1985) that the schools are among the most conservative institutions in our societies. The adoption of an innovation is slow and almost always has to be imposed on the system from outside. Studies have shown that innovations will be adopted only if they do not go against the values, norms and aspirations of the people who have to make them work. There is ample ground for fear that computers in schools could suffer from the same fate as other educational innovations. If computers are not to belong to the long list of discarded educational innovations, careful consideration has to be given to the dissemination and implementation processes. To achieve this aim, research and evaluation is needed on the social, psychological, organizational and management factors involved in introducing computers in the existing school system.

During the recent years, some research studies have been carried out in the field at the national level. Lalitha and Shailaja (1986) conducted a study on Computer-Assisted Instruction (CAI) in relation to traditional teaching and came out with the conclusion that CAI was more effective than traditional teaching with respect to imparting knowledge but not so as regards developing understanding. Stella (1989) studied the development of Computer-Assisted Learning material to introduce "the language of sets" for students of standard VII and proved that CAL material was more beneficial to the average and low achievers and there was a significant difference between the performances of the CAL group and the traditional group. Padma and Chakrabarty (1990) studied the attitude of high school students towards computer education and concluded that significant difference existed between the attitude of boys and girls towards computer education. They further concluded that there was no difference between tribal and non-tribal students as regards their attitude towards computer education.

Commenting on the modern trends of research conducted at the national and international levels, SEAMEO (1985) has reported that most of the researches today are based on the scientific researches paradigm. This type of studies can investigate such aspects as the relative effectiveness and efficiency of computer-based teaching/learning versus traditional methods as well as the relative merits of various computer-based teaching/learning modes. In these studies the dependent variable(s) include(s) students' cognitive, affective and psychomotor develop-

ments for which there are readily available valid and reliable measures. If we have a closure view on the research studies stated above, we find the comments of SEAMEO justified. There is still ample scope for further research for judging the effect of the computer-assisted instruction method of teaching mathematics. For example, most of the studies referred above, have used commercially prepared software for judging the CAI effectiveness. What will be the impact of the CAI method of teaching mathematics on total mathematics achievement if it is made a regular feature of classroom teaching based on computer programmes well prepared by a group of expert teachers? Up to what extent will the CAI method of teaching mathematics bring about change in students' attitude towards mathematics? Such type of questions have still remained unanswered.

The present study was designed with the following specific questions in view:

1. What are the appropriate units of ninth class mathematics syllabus which can be better taught through CAI?
2. In the context of present traditional environment of Indian schools, where a significant number of teachers do not use manipulative materials in their presentations of mathematical concepts, is it possible that the computer with its graphics potential can give a representational model of these targets of difficulty? Can the pictorial model offered by the computer, give students a greater understanding of some difficult concepts of high school mathematics than the chalkboard, pencil and paper model, most often used by high school teachers? If so, up to what extent will the mathematics achievement of the students taught through CAI be affected?
3. It is a reality that unlike the radio, the TV, the tape-recorder or any other medium of communication that students are familiar with, the computer invites the learner to a dialogue with itself. It does not just give the learner a one-way flow of information, it welcomes him to react with it. How and up to what extent is this interactive mode of CAI helpful in demystifying the notion of treating mathematics as an inert and difficult subject and also in making mathematics more popular, more interesting among students?

In order to answer such questions, the investigator undertook the present study.

## OBJECTIVES

The major objective of the present study was to compare the results of computer-assisted instruction and conventional method of instruction in teaching mathematics in the selected three units of the mathematics curriculum of Class IX, e.g. (1) Simultaneous equations in algebra, (2) Statistical data and their graphical representation in statistics, and (3) Triangles and their congruencies in geometry.

The other incidental objective of the present study was to find answers to the following four questions.

1. What difference in mathematics achievement occurs as a result of the difference in instructional strategies?
2. What difference in mathematics achievement occurs among boys and girls as a result of the two different instructional strategies?
3. What is the direction of change in attitudes of students towards mathematics as a result of the two different instructional strategies?
4. What is the direction of change in attitudes of male and female students towards mathematics as a result of the two different instructional strategies?

### HYPOTHESES

The following four null hypotheses were formulated and subjected to statistical testing:

1. There is no significant difference in the pre-test and post-test mean differentials in mathematics achievement for the experimental group and the control group.
2. There is no significant difference in the pre-test and post-test mean differentials in mathematics achievement for boys and girls within the experimental group and the control group.
3. There is no significant difference in the pre-test and post-test mean differentials in attitudes towards mathematics for the experimental group and the control group.
4. There is no significant difference in the pre-test and post-test mean differentials in attitudes of boys and girls towards mathematics within the experimental group and the control group.

### DESIGN

The present study was quasi-experimental in nature. It did not stand the demands and pre-requisites of a rigorously controlled strict experimental investigation.

### SAMPLE

The study was conducted in four selected higher secondary schools of Bhilai Steel Plant, Bhilai (Madhya Pradesh). Out of the fourteen higher secondary



schools of Bhilai Steel Plant, Bhilai, eleven schools are equipped with three to five BBC microcomputers. These schools are situated in different sectors of Bhilai Nagar and their students come from rural and urban, lower, middle and upper classes of the society. They consist of the children of labourers, peons, teachers, engineers, officers, businessmen and farmers. In this way the students of higher secondary schools of Bhilai Nagar represent the population of a cosmopolitan society of any such township or city in Madhya Pradesh.

The study covered three types of higher secondary schools of the Bhilai Steel Plant, Bhilai, selected on the basis of ratings of five experts. The schools were classified into three categories: (1) Good Schools, (2) Average Schools, and (3) Poor Schools.

TABLE 1 Description of Sample: Schools and Class IX Students			
School Category	No. of Schools	Orientation	Sample Size
Good Schools	1 (Boys)	CAI (E) CM (C)	20 20
	1 (Girls)	CAI (E) CM (C)	30 30
Average Schools	1 (Mixed)	CAI (E) CM (C)	30 30
Poor Schools	1 (Boys)	CAI (E) CM (C)	30 30
TOTAL			220
KEY: CAI —Computer (micro-computer) Assisted Instruction CM —Conventional Method of Instruction E —Experimental Group taught through CAI C —Control Group taught through CM			

Three units of mathematics syllabus for Class IX prescribed by the Madhya Pradesh Board of Secondary Education, Bhopal, namely (1) Simultaneous Equations in Algebra, (2) Statistical Data and their graphical representation in statistics, and (3) Triangles and their congruencies in Geometry, were chosen for study.

In order to study the impact of the sex factor on achievement and attitude, new experimental and control groups were formed by one-to-one matching on IQ scores. Thirty boys and 30 girls of equal IQ were chosen from 110 students of the total experimental group. Likewise, 30 boys and 30 girls were chosen from the remaining 110 students of the previous control group which formed new control group.

## DESIGN OF THE EXPERIMENT

Before the conduct of the experiment, the General Intelligence Test developed and standardized by Professor S.M. Mohsin of Patna University, Patna (Bihar) was administered to the students of two sections of Class IX in each category of schools. This test was administered to keep the variable of GMA constant. The subjects were divided into two groups of 30 students each on one-to-one matching. The Computer Assisted Instruction (CAI) group was named as the Experimental Group and this group was taught through computer programmes prepared by subject experts of the Education Department of the Bhilai Steel Plant, Bhilai Nagar. The Conventional Method (CM) of Instruction group was termed as the Control Group and was taught through the conventional method of talk-chalk, paper-pencil and blackboard work. Lesson plans, worksheets and guidelines on chosen units were prepared and provided to the teachers involved in the conduct of the experiment.

Both the groups were taught by the same teacher in each school and thus the teacher factor variable was somewhat satisfactorily controlled. Before starting the experiment, criterion tests in two parallel Forms A and B based on the learning objectives—knowledge, understanding, application and skill, with their related processes were prepared. After tossing a coin, Form B of the criterion test was used for pre-test. Form A was kept for the post-test. The experimental and control groups were also randomly labelled/decided after flipping a coin.

The experimentation work was completed in five stages and it nearly took three months' time. To control extraneous variables contamination, a properly chalked out "Work Plan" was followed for the purpose of the experiment. It was decided that the students should work in teams at the computer. Each team consisted of five students. With three computers in each classroom, 15 students could be accommodated each day. In this way, each student of the experimental group of 30 members could use the computer two days a week by turn. Each group of 15 members spent one day at the computer and one day off the computer in every two days' cycle. At the beginning of each class, the entire group met the teachers and discussed the previous home assignment and received new instructions for the day's work. After ten minutes, the group designated to work at the computer, moved to the computer corner and the other group continued with the teacher. This procedure was replicated/repeated for three weeks. The twenty-second day was reserved for evaluation.

During the experimental session, teachers met together once in every two weeks to discuss the difficulties, if any, faced by them and reviewed the needed technical assistance.

For the post-test, Form A of the criterion test was administered to both the groups of each school.

## TOOLS AND TECHNIQUES

The following tools and techniques were used in the conduct of the study:

1. A rating scale, devised by the authors, was used to select different category of schools.
2. The General Intelligence Test developed and standardized by Professor S.M. Mohsin of Patna University, Patna (Bihar) was used to equate the groups on one-to-one matching on the variable of General Mental Ability (GMA).
3. The teacher-made pre-test (Form B) and post-test (Form A) were administered as tools to collect data on mathematics achievement. Split-halves reliability co-efficient for Form A of the criterion test was found as 0.66 and the total test reliability co-efficient was 0.80. Likewise, split-halves reliability co-efficients for Form B of the criterion test was 0.67 and the total test reliability coefficient was 0.80. The correlation coefficients between IQ and mathematics achievement on pre-test and post-test were found to be 0.83 and 0.78, respectively. In order to judge the validity of these tools, correlation coefficients between IQ scores and Middle School Board's Examination scores in mathematics; pre-test scores and Middle School Board's Examination scores in mathematics, were calculated. These were found to be 0.74 and 0.69, respectively.
4. To assess the attitude of the students under study, a scale for measuring attitude towards mathematics (Form B) developed and standardized by Suydam (1974) was administered. This scale was translated into Hindi and adapted by the investigator under the guidance of Professor S.P. Ahluwalia, to suit the Indian conditions. This scale has 26 statements, out of which 13 are favourable and 13 unfavourable. Its test-retest reliability coefficient is 0.62.
5. After the trial session of experimentation, Computer Need Inventory was administered to the trained teachers of the schools of the Bhilai Steel Plant, Bhilai.

## ANALYSIS AND INTERPRETATION OF DATA

The data obtained on pre-test and post-test were processed by calculating 't' of correlated means so that the relative effectiveness of one method over the other could be identified. In order to confirm any real difference in the relative merits of the methods from school to school, the ANCOVA method of analysis was used on the pooled data. In order to test the impact of the sex factor on achievement and attitude, the data were analyzed by using the ANOVA and ANCOVA techniques.

Table 2 shows in a summary form, the results of the analysis of the data relative to the gains in achievement of the experimental and control groups from pre-test to the post-test stage. It is clear from the table that the means and standard deviations of the control and experimental groups in the pre-test stage are almost identical in each category of schools, showing the original matching of the groups to have been quite satisfactory. The results of the analysis of the data of the post-test achievement scores of the control and experimental groups using the equivalent group technique (Garrett, 1973), of correlated means are shown in this table. Very high positive correlation between the post-test scores of the control and experimental groups (shown in Table 2) was found. In such cases, Garrett suggests that the standard error of difference (SED) between correlated means (formula  $SED = \sqrt{\sigma_{m_1}^2 + \sigma_{m_2}^2 - 2\gamma \cdot \sigma_{m_1} \cdot \sigma_{m_2}}$ ) is calculated for testing the significance of the difference between the means. These results reveal that the given difference is significant at .01 level in each category of schools. Hence, it can be summarised that the subjects of each category of schools gained significantly better on the post-test in the experimental group than in the control group. This gain is more marked in the category of 'good' schools in comparison to the categories of 'average' and 'poor' schools.

In order to confirm the results obtained above, Table 3 gives the results of the analysis of covariance (ANCOVA) using the post-test achievement scores (pooled) as the dependent variable and the pre-test scores (pooled) as the covariate. Since the pupils in each class in each school were matched on IQ scores and in each school of all the three categories of schools, with the same teacher teaching both the experimental and control groups, the test of significance of real differences in the relative merits of the methods from school to school was of particular interest. "If there is any real difference of this kind", reiterates Lindquist, "it is particularly appropriate to base our test of significance upon these differentials or interaction effects, since if one method is to be recommended for general use, it must be best for all schools and not only for some, or at least it must be the best for most of the schools". According to Lindquist, the precision of the experiment will of course depend on the magnitude of the 'Methods by Schools' ( $M \times S$ ) variance (or upon the variance of class means after school and methods differences have been eliminated).  $M \times S$  variance as an error estimate for the ANCOVA analysis was justified. According to Table 3, an F value of 42.85 is significant at .05 level of significance and it confirms that there was indeed a difference in the achievement levels of the three categories of schools. Thus it can be concluded that the computer-assisted instruction (CAI) method of teaching mathematics facilitated effective and better teaching-learning situations in mathematics, as manifested in the form of higher achievement scores, in comparison to the conventional method of teaching mathematics.

TABLE 2  
Means, SE and 't' of Correlated Means of Control and Experimental Groups on Post-test Achievement Scores  
(The Method of Equivalent Groups)

School Category	Group	N	Pre-test		Post-test		r	SE	D	df	t	Inter- pretation
			M	S	M	S						
1. Good School (Boys)	Experimental Control	20	15.35	4.27	23.50	4.53	0.91	0.43	5.95	19	13.84	p < .01
		20	15.10	3.34	17.55	4.22						
2. Good School (Girls)	Experimental Control	30	11.03	2.64	19.63	4.67	0.90	0.37	4.60	29	12.43	p < .01
		30	10.40	2.85	15.03	4.52						
3. Average School (Mixed)	Experimental Control	30	10.23	2.84	17.70	4.23	0.79	0.53	3.33	29	6.28	p < .01
		30	9.83	3.09	14.37	4.61						
4. Poor School (Boys)	Experimental Control	30	9.50	2.57	14.40	2.98	0.74	0.37	3.20	29	8.65	p < .01
		30	9.17	2.41	11.20	2.52						

TABLE 3  
Analysis of Covariance Using Post-test Achievement Scores as Dependent Variable and Pre-test Scores as Covariate

Source of Variation	df	Adjusted SSy	MS	F	t	Interpretation
Method (M)	1	65.13	65.13	42.85*	6.55	p < .05
Method $\times$ Schools (M $\times$ S)	2	3.04	1.52			
TOTAL:	3	68.17				

\* significant at 0.05 level of significance

Table 4 gives means, SD, SE and 't' of correlated means of the control and experimental groups on the pre-test and post-test attitude scores. In order to study the change in attitudes towards mathematics of the pupils of the control group and the experimental group separately, an analysis appropriate for 'The Single Group Method' is used in this table. The results obtained indicate that in each category of schools, there is change in attitude towards mathematics of the pupils of the control group from the pre-test stage to the post-test stage. This change in attitude was found to be significant at 0.05 level in good category of schools for boys, at 0.01 level in good category of schools for girls, at 0.05 level in average schools and at 0.01 level in poor schools. In the experimental group taught through CAI, this change in attitude was found much higher and it was found significant in all categories of schools at 0.0005 level of significance. A marked change in attitude towards mathematics if the pupils of the CAI group has occurred in comparison to the pupils of the control group. A close scrutiny of the results reveals a very interesting fact that the mean difference between the attitude scores ( $D = 8.40$ ) from the pre-test to the post-test is the highest for the pupils of good schools (boys) in the control group but it is ( $D = 10.27$ ) the highest for the pupils of poor schools in the experimental group. This indicates the popularity of computer-assisted instruction amongst the pupils of low socio-economic status, of lower IQs, and of slow-learners.

Table 5 gives the results of ANCOVA in which positive changes in the attitude of pupils of the experimental and control groups were confirmed through analysis of covariance, with the pre-test scores being controlled. An F value of 14.73 is significant at 0.01 level of significance. It can, therefore, be concluded that very high positive changes in the attitude of the pupils of the experimental group taught through the computer-assisted instruction method were established in comparison to the pupils of the control group taught through the conventional method.

Table 6 gives the results of the analysis of variance (ANOVA) for the data to study the effect of sex difference on achievement. For this purpose, methods of teaching (A), sex (B) and occasion of testing (pre-test and post-test) (C) were taken as factors. Each main factor has two levels, namely A has two levels as CAI and CM, B has two levels as male and female students and C has two levels as pre-test and post-test occasions. Hence, the data were analyzed by using the method of  $2 \times 2 \times 2$  factorial experiment. The summary of the complete analysis of variance is presented in Table 6 where the sums of the squares have been divided by the number of degree of freedom to obtain the mean squares. The values of F which have been entered in the table, were obtained by dividing each of the mean squares by the error mean square.

EXPERIMENTAL GROUP												
S.N.	School Category	N	Pre-test		Post-test		D	r	SE	df	t	Inter- pretation
			M	S	M	S						
1.	Good School (Boys)	20	77.00	14.01	86.05	12.28	9.05	0.83	1.81	19	5.00	p < .0005
2.	Good School (Girls)	30	69.27	13.00	77.17	12.00	7.90	0.70	1.81	29	4.36	p < .0005
3	Average School	30	70.67	10.20	79.00	9.25	8.33	0.34	2.08	29	4.00	p < .0005
4.	Poor School	30	63.07	15.35	73.34	11.75	10.27	0.60	2.33	29	4.41	p < .0005
CONTROL GROUP												
5.	Good School (Boys)	20	71.30	9.58	79.70	9.21	8.40	0.30	2.56	19	3.28	p < .005
6	Good School (Girls)	30	69.33	12.30	74.43	11.35	5.10	0.80	1.40	29	3.64	p < .001
7.	Average School	30	72.93	14.90	78.67	11.35	5.74	0.24	3.05	29	1.88	p < .10
8.	Poor School	30	65.33	12.45	69.33	11.25	4.00	0.76	1.54	29	2.60	p < .02

TABLE 5  
Analysis of Covariance Using Post-test Attitude Scores as Dependent Variable and Pre-test Scores as Covariate

Source of Variation	df	Adjusted SSy	MS	F	t	Interpretation
Between Treatment	1	837.35	837.35	8.13	2.85	$p < .01$
Within Groups	217	22337.75	102.94			
TOTAL	218	23175.00	106.31			

TABLE 6  
Analysis of Variance ( $2 \times 2 \times 2$  Factorial Experiment) Results for the Data to Study the Effect of Sex Differences on Achievement

Sources of Variation	Sum of Squares (SS)	df	Mean Squares (MS)	F	Interpretation
A : Method	331.349	1	331.349	11.923	$p < .001$
B : Sex	66.149	1	66.149	2.380	ns
C : Occasions	2100.416	1	2100.416	596.370	$p < .001$
A $\times$ B : Method $\times$ Sex	2.819	1	2.819	$< 1$	ns
A $\times$ C : Method $\times$ Occasion	260.419	1	260.419	64.476	$p < .001$
B $\times$ C : Sex $\times$ Occasion	18.152	1	18.152	4.944	$p < .025$
A $\times$ B $\times$ C : Method $\times$ Sex $\times$ Occasion	0.41	1	0.41	$< 1$	ns
Pupils (P) within A $\times$ B	3223.666	116	27.790		
Residual (P $\times$ C) within A $\times$ B	468.603	116	4.039		
TOTAL	6471.983	239			

TABLE 7  
Analysis of Covariance Using Post-test Attitude Scores of Boys and Girls Students as Dependent Variable and Pre-test Attitude Scores as Covariate

Sources of Variation	df	Adjusted SSy	MS	F	t	Interpretation
Method $\times$ Sex (M $\times$ S)	1	159.21	159.21	2.59	1.61	ns
Within Classes	117	7190.24	61.46			
TOTAL	118	7349.45	220.67			



One essential difference should be noted here between a comparison of the different levels of method and sex, on the one hand, and of the different levels of occasions, on the other. The different levels of method and sex contain the scores of different pupils while both occasions contain the scores of the same pupils. Pupils, in other words, appear as an additional factor, one which is nested within method and sex but which, within each of the cross-classification of method and sex, is crossed with occasions. The experiment can be regarded as a 'four-way experiment', since each score may be classified in four ways, i.e. as belonging to a particular method (A), sex group (B), occasion (C) and pupil (P) (Lewis, 1968). There are two error terms, the mean square for pupils (P) and that for the residual ( $P \times C$  within  $A \times B$ ). The mean square for pupils is the error term for all effects based on sets of scores from different pupils, i.e. method (A), sex (B) and interaction  $A \times B$ . The residual mean square is the error term for all other effects, i.e. those involving occasion (C), and therefore based on sets of scores from the same pupils. An inspection of the table indicates that the difference on achievement measures in the main factors method and occasion and in the interactions 'method  $\times$  occasion' is statistically significant at 0.01 level. Interaction 'sex  $\times$  occasion' is significant at 0.025 level. The main effect of the factor sex (B) and that of interactions 'method  $\times$  sex' and 'method  $\times$  sex  $\times$  occasion' are found not significant. The fact that the method mean square is significant leads to the conclusion that the mean achievement score of CAI differs significantly from the mean achievement score of CM. CAI definitely results in a higher mean achievement score (15.27), compared with CM (mean achievement score of 12.92). It confirms the results of Table 2. The non-significant effect of the factor sex (B) tells us that the means for male and female students do not differ significantly. Also, the non-significant interaction 'method  $\times$  sex' ( $A \times B$ ) tells us that the difference between the achievement measures of the CAI method of teaching mathematics and the conventional method of teaching mathematics is not dependent upon a particular sex.

As the analysis of covariance method adjusts for pre-test scores, the technique of analysis of covariance (ANCOVA) was used to measure the change in attitude towards mathematics on the basis of the final attitude scores of male and female students well adjusted for their initial scores. Table 7 gives this result. In this table, the results of the analysis of covariance (ANCOVA), using the post-test attitude scores for boys and girls as the dependent variable and the pre-test attitude scores as the covariate are shown. An F value of 2.5 in the table is not significant at 0.05 level of significance. It indicates the fact that males and females do not differ significantly in the change of attitudes towards mathematics. Hence change in attitude towards mathematics is independent of the sex factor.

## DISCUSSION OF THE RESULTS

The degree and direction of changes in achievement and attitude towards mathematics might be summarized as follows:

A close examination of the results pertaining to individual classes in different categories of schools shows that although significant differences existed between the entire groups, individual classes showed different results of the treatment. Gains in achievement of the pupils of good categories of schools. This throws light on the fact that as far as group learning by using the computer as a classroom tool is concerned, good and intelligent students of schools providing better teaching-learning environment, might be more benefitted. This conclusion is supported by the findings of earlier investigators Thomas A. Adams, Philip B. Waldrop, Joseph E. Justen, Carala Hensley and McCrosky (1987). The purpose of their study was to examine the relationship between ability or aptitude with or without CAI. The results of the study seem to indicate that an aptitude treatment interaction occurs with CAI and this might indicate that higher ability students function better with CAI and lower ability students are less able to profit from CAI.

The Computer-Assisted Instruction (CAI) method of teaching mathematics has proved more effective in comparison to the conventional method (CM) of teaching in all categories of schools. Reasons for this interesting result might be that the use of the computer for its graphics and sound, speed and ease of use capabilities as an electronic blackboard, is particularly suited for mathematics teaching. It can facilitate demonstration, display of data, drawing of curves, solving of equations and many other areas of mathematics. In a conventional method of teaching, the student is a passive recipient of knowledge but in the CAI method he is actually engaged in learning from a variety of sources, such as the teacher, the computer and other students. These results tend to corroborate the findings of earlier investigators Wright, Pamela (1983), Abraham, Sandma (1984), Sasser, John Ester (1984), Lavy Max Hensy (1985), Grady (1986) and Stella (1989) that individuals utilizing the CAI method learn better than those using the conventional procedures.

An examination of the results for boys and girls showed that both boys and girls gained more from the computer treatment than from the traditional class treatment. Achievements of boys and girls are independent of the sex factor. This result agrees with the finding of Sasser, John Ester (1984) in which it is indicated that there was no significant difference between the performance of male and female students due to difference in the instructional strategies.

On the whole, significant positive change in attitudes of pupils of the experimental group over the control group has been established in this study. This result of the present study is seconded by the result of a similar study of Dotton (1985)

who determined the effects of different amounts of CAI on the biology achievement. He found that students receiving CAI had a more positive attitude towards computers than students receiving only conventional instruction.

It is also found that change in attitude towards mathematics of boys and girls is independent of the sex factor. This result suggests that both male and female students of Bhilai Nagar are equally aware of the occurrence of computer revolution in the present day. Students belonging to both the sexes are motivated to enter and experience the equal utility of the computer in classroom teaching. Here it is worth noting that in a similar study, Padma and Chakrabarty (1990) have concluded that a significant difference exists between the attitude of boys and girls towards computer education. Contradiction between the results of these two studies seems justified as girl students in hilly areas like Shillong are more conscious and are aware of the technological progress and innovations of the present day than boys. This is not the case in plain areas where the present study has been carried out. Positive change in attitude towards mathematics of the pupils of the CAI group might be the outcomes of immediate feedback of the CAI results which enables the pupils to continuously evaluate their progress in the course. Increased group interaction facility in the CAI method, usually thought to be a condition which fosters learning, seems to have positive effect on achievement and also on developing positive attitude towards mathematics in the pupils of the CAI group. This might also be the cause of one interesting result of the present study that the students of the CAI group in the poor category schools showed the highest post-test attitude scores. Students of average intelligence and slow learners can utilize computer-assisted instruction according to their own pace and capacities which is not possible in the conventional method of teaching.

### SOME BROAD CONCLUSIONS

Based on the analysis and interpretation of the data, and the discussion on the results, the following conclusions can be drawn:

The results of the study showed significant differences between the mathematics achievement of the students who used the computer for specific topics in the Class IX syllabus of mathematics, compared to the students taught through the conventional method. The students who used the computer scored significantly higher on the post-test than those who did not use the computer. Significance of the difference in achievement scores of male and female students has not been established.

The students who used the computer showed significantly highly favourable attitude towards mathematics than those who did not use the computer. Change in attitude towards mathematics was found independent of the sex factor.

To sum up, within the confines set by the conditions of this experiment, the computer-assisted instruction method of teaching proved more effective in teaching Class IX mathematics, in comparison to the conventional method, in each of different categories of schools. The students will learn better through CAI, with the attainment of better knowledge, concept and application abilities. It will, in turn, enhance higher motivation in the students, resulting in the development of favourable attitude towards mathematics. Thus in order to make mathematics teaching more fruitful, more interesting at high school level, computer-assisted instruction in mathematics teaching is strongly recommended.

#### SUGGESTIONS FOR FURTHER RESEARCH

The present study clearly demonstrates that computer-assisted instruction might bring fruitful results in the cognitive and non-cognitive variables of mathematics. This study throws up several other issues which deserve further investigation. They are:

1. Effectiveness of Teaching Mathematics through Computer-Assisted Instruction and Conventional Method of Instruction on Cognitive (Creativity) and Non-cognitive (Test Anxiety or Achievement Motivation or Academic Motivation) Variables of Class IX students.
2. Effectiveness of Longer Study of Computer-Assisted Instruction on the Achievement and Attitude of Students.
3. Possibilities of Greater Academic Achievement of Slow Learners in Mathematics through Computer-Assisted Instruction in comparison to Conventional Method of Instruction.
4. Effect of the use of the Computer in a Rural High School Mathematics Classroom.
5. Effect of the use of the Computer for Mathematics Instruction in a Higher Secondary (+2) Classroom.
6. Staying Power of the Effectiveness of Computer-Assisted Instruction.
7. Effect of the use of the Computer in Wider Range of Topics in Class IX Mathematics Syllabus.
8. Effectiveness of the Computer in Teaching Mathematics as a Teaching Aid.
9. Effectiveness of the Computer on Teachers' Teaching Styles.
10. Effectiveness of the Computer on Teachers' Own Learning.

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## **Alternative Concepts of Science and Psychology and their Implications for Education**

**(MS) ALKA BEHARI**

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**I**T seems that there is a pattern in the great changes that are sweeping across the planet today. It can be said that a revolution is taking place in the truest sense of the word, the sense in which revolutions had been made by Galileo, Darwin, Einstein, Freud and Marx. This revolution will not be like the revolutions of the past. This is the revolution of the new generation. It is spreading with amazing rapidity, and already our laws, institutions and social structure are undergoing drastic changes. An analysis of this revolution in the offing cuts across History, Economics, Sociology, Psychology, Education, etc. and there is no doubt that it will be related to these. In fact it seems that the new revolution is itself an influence of the changing concepts in disciplines, especially in Science and Psychology. As educationists, we are concerned with the child and these alternative concepts of science and psychology are having a profound influence on education.

In moulding the society, the role of science has been all pervasive throughout the human history. In fact, it is modern science which is responsible for changing the economy of life and that of the society at a speed often too fast to comprehend. The impact of science, emanating from its concept, is now phenomenal. The net result is modernisation—a word whose effects are bringing in enormous hazards in life such as mechanisation, alienation, fragmentation, dehumanisation, superficial relationships, value-system of 'having' valued more than 'being', lack of time or opportunity for self-expression or one's uniqueness to evolve. Thus, while science has made our life generally easier, there are many issues which are working in adverse directions also, making human life unhappy in several ways.

Science, especially natural science, may be considered as the study of the physical world, involving nature (in fact, biology as the name suggests is the study of life itself). At the same time education is concerned with man's life; it involves the human being in his or her totality. Therefore, the relationship between man and nature is of great significance.

Considering psychology, not only has it, via humanism, come back to its original source, philosophy, but even sciences are drawing close to philosophy. In fact, the characteristics of self-actualised people given by Maslow (the forerunner of Humanistic psychology) are found to come very close to the characteristics of *Balanced Mind* (समबलित मन) and *yogi* as enunciated in the *Bhagvad Gita* and even the concept of education has come very close to the ancient ideas of *guru* who emphasised education as liberation.

It has been seen that studies of these and related themes have not provided the basis of much research in our country. This paper is an attempt in that light and offers some food for thought. It attempts to review and reflect these alternative concepts in science and psychology and their implications for education. It tends to focus on the nature, origin, ideology and development of the old, changing as well as new concepts and attempts to find out if there is a common philosophical trend behind the changes in these disciplines.

## MODERN PSYCHOLOGY

In the beginning, psychology was generally considered to be a branch of philosophy and a part in that division of philosophy that was called metaphysics. In a sense, associationism may be considered as the first 'school' of psychology because before this it was not psychology but philosophy. Thus, psychology was on the verge of becoming a science, gradually moving from speculation to empirical to experimental.

Later, scientific psychology was systematised further by Titchener who called it structuralism or introspectionism. According to Titchener, "the subject matter of



physics is experience, independent of the experiencing person; the subject matter of psychology is experience dependent on an experiencing person." In physics, e.g. space, time and mass are always the same unaffected by the person who experiences them, unlike in psychology where they may change according to the conditions. Interestingly, these precisely are the very concepts in science that the researcher finds changing today, thus bringing science closer to psychology, as will be seen later. Titchener says that science has nothing to do with values. This concept about science again is on the verge of a change and people today talk of the myth of a value-free science and question the neutrality of science.

Later, introspectionism gave way to functionalism wherein the theories of conditioning and behaviourism encompassed the entire behaviour. If psychology is to ever become a science, it must become materialistic, mechanistic, deterministic and objective. As Skinner, in his book *Beyond Freedom and Dignity* proclaims: "we can no longer afford freedom and so it must be replaced with control over man, his conduct and his culture." Skinner is convinced that behaviour is determined not from within, but from outside. So, the subject matter of psychology became behaviour, i.e. movements in space and time and only objective methods were accepted as valid. Therefore, in education, learning, irrespective of its precise nature, became a thoroughly material and mechanical affair. Thus classical behaviourism took its cue from classical physics analysing the human being as an organic machine and conceiving all human reactions into specific stimulus-response connections.

As a consequence of all these major schools, an age of theories began to dominate areas of psychology such as personality theories, learning theories, theories of development, of social psychology, etc.

Today, man finds himself in a state of profound crisis since modern society emphasises dissecting, measuring, weighing and calculating analytical intellect. Today, we tend to 'evaluate' everything—men, nature and society—according to its usefulness and not according to the essential qualities of its being.

The researcher shares with Maslow and Rogers the view that there are three broad thrusts in psychology today. Associated with the first trend are terms such as behaviourism, objective, experimental, impersonal, logical-positivistic, operational, laboratory. Associated with the second current are terms such as Freudian, psychoanalytic, and associated with the third are terms such as phenomenological, existential, self-theory, self-actualisation, health and growth psychology, being and becoming. The first, i.e. behaviouristic, associationistic, mechanomorphic psychology can be called 'classical' since it is in direct line with the classical conception of science which comes out of astronomy, physics, chemistry and geology.

Now what is developing today is the third, more inclusive image of man which is already in the process of generating great changes in all intellectual fields and in

all social and human institutions. It is called the 'Third-Force' psychology—a term quite appropriate for what it stands for. From a historical point of view, it is seen that it was the impact of the work of Jung, Fromm (1955) and others which ultimately led to the emergence of a clearly defined humanistic orientation in psychology. Maslow talks of self-actualised people—people who are biologically sound, psychologically healthy, cognitively and perceptually superior. Maslow tries to progress towards what he calls the "father reaches of human nature."

This third force psychology is in fact considered by Maslow to be transitional, a preparation for a still 'higher' fourth psychology—transpersonal (Sutich), trans-human (Huxley). It is concerned with expanding the field of psychology to include the study of optional psychological health and well-being. Unlike Freudian or behavioural psychology, transpersonal psychology does not yet have an organised theory but this lack of organisation is typical in the early stages of the formation of a new science (Kuhn, 1964).

### MODERN SCIENCE

Science is, beyond question, the outstanding feature of modern civilisation. But what is science? "A distinction, though not a rigid dichotomy, can be made between two kinds of knowledge (cumulative and non-cumulative)" (Brinton). Cumulative knowledge is typified by science, since through the centuries, it has been built up by accretions slowly added into the core of truth. Non-cumulative knowledge, on the other hand, is well-illustrated by literature. However, if one looks at the German word *Wissenschaft* which is translated as science, it includes all branches of scholarship, including literary and historical studies. In fact, science is the Latin word for knowledge itself and in this context, to be thought 'unscientific' might obviously have serious implications. To maintain, therefore, an impassable divide between science and non-science is to perpetuate a gross misunderstanding.

The development of research into the history of science is closely linked to the progress of science itself and to its changing position in society. The revolution in natural sciences in the late nineteenth century and early twentieth century gave rise to a change in the attitude to science. Till the nineteenth century, it was called Natural Philosophy.

Similarly, the development of scientific method can be traced from observation (when science of astronomy was popular), and deduction, followed by experimentation (during the time of Galileo and Newton).

The history of Western science owes its origins to Greek thinkers of its period when science and psychology were both parts of the same study, i.e. the enquiry into the essential nature of things. This essential nature was termed *phusis* and

from it is derived our modern term 'physics'. In the seventeenth century, Descartes formulated the theory of an essential dualism between mind and matter.

Later, two developments in physics which culminated in Relativity theory and in quantum mechanics, shattered all the principal concepts of the Cartesian world view and Newtonian mechanics. The stage of Newtonian mechanics, on which all physical phenomena took place, was the three-dimensional space of Euclidean geometry. It was an absolute space. All changes in the physical world were, therefore, described in terms of a separate dimension, which again was absolute. The Newtonian model and matter was thus atomistic. Two centuries later, Mach discovered Newton's logical blunder—the very idea that absolute time flows equally without relation to anything external was found to be scientifically useless and philosophically impossible.

It was Einstein who proposed a view of the universe radically different from that of Newtonian mechanics. In Newton's theory, space and time were regarded as independent factors. Einstein declared that such a division was in fact incorrect and that the doctrine of space in three dimensions and a separate time element should be replaced by a four-dimensional continuum of space-time. One of the important corollaries of Einstein's theory of relativity is that it is impossible to determine absolute velocity which must always be relative to the observer.

The analysis which follows from the above is that this theory showed a harmonious view of the universe. This has an important implication that even in science, the object of research is no longer nature in itself but man's investigation of nature.

## PSYCHOLOGY AND SCIENCE: PAST, PRESENT AND FUTURE ALTERNATIVES

### *Alternatives in Psychology*

Skinner has claimed that we can discover experimentally what is valuable. He feels that the only serious explanations are those based on the mechanistic view of living organisms, satisfying the criteria of Newtonian physics. Thus, this is a clear example of Newtonian psychology par excellence which is depicted in his books *Beyond Freedom and Dignity* (1974) and *Science and Human Behaviour* (1938).

Can the method of natural science alone be adapted to the studies of man and society (man's experiences, his artifacts, his values, his history, his future)? If psychology is a science, then throughout its history as science, the hard knowledge which it has deposited has usually been negative knowledge. The researcher feels that Koch in his write-up *Psychology: A Study of Science* (1963) is urging psychology to develop its proper role as a social science—'a third force'—bridging the gap which separates the sciences from the humanities.

It is felt that behavioural psychology provides a frame of reference for dealing with human problems in precise goal-oriented terms, i.e. it involves closed systems of thinking—a product-oriented system where people are regarded as objects. This, in turn, is likely to produce feelings of de-humanisation and alienation. Koch (1976) pays a rich tribute to Maslow, the father of Humanistic psychology, when he says: "Abe Maslow expressed his belief that Humanistic Psychology would live to become 'The Psychology' by another twenty years. I doubted Abe's forecast then, but the older I get, the more I think he was right."

The above discussion dealt with the psychologies *per se*, but there is also an interesting and amazing instance of an adaptation of the alternative in psychology and this is the adaptation of Maslow's Theory of Motivation.

Roberts (1975) talks of beginning a humanistic normal science. He has formulated his adaptations of Maslow's types of motivation as:

MASLOW	DEVELOPMENTAL STAGES
1. Physiological	Survival
2. Safety	Stability
3. Love	Sociability
4. Esteem	Expertise
5. Self-actualisation	Self

As a child grows older, he passes through a chain of stages. At each period of transition, the child and his world become transformed. Similarly, this approach is also used to re-interpret topics in developmental psychology and moral development. Piaget has also observed that the younger stage in a child is characterised by an authoritarian orientation (stability) while the later stage by an awareness of other people (sociability) and, finally, by the self (autonomy). All this shows that Maslow-based humanistic conceptual framework can even help one to understand some of Piaget and Kohlberg's observations about moral development by putting the theory into wider theoretical framework.

So it can be visualised that there are several steps to take on the road toward a humanistic view of man, which involve re-interpretation of present studies, re-asking old questions and asking new questions.

Nandy (with whom the researcher had the opportunity to have a session of discussion) is of the view that modern psychology has de-psychologised man in the age of the psychological man. It has popularised a concept of person which is for the most part mechanomorphic, two-dimensional and anti-psychological. This is brought out clearly in his article "Political Dimensions of Psychology" (1983).

Today the need for an 'ecological' psychology has been realised. The recent growth of humanistic psychology and transpersonal psychology in America is

distinctly an influence from India and a 'reverse flow' from the East has begun. With the result, there would soon be an impact of the Third World on the development of psychology (Sinha, 1969).

### *Alternatives in Science*

The atomisation of phenomena brought by the process of ever-increasing abstraction, can be traced to be another name for Conceptual Alienation. Conceptual Alienation, which is a pre-condition for successful practice of all qualitative science, is only one step away from psychological alienation. We cannot escape the conclusion that conceptual alienation, developed under the auspices of modern science, is at the root of all alienation in social and human relations (Steneck, 1975).

What the author wishes to propose is that we should leave the Newtonian and Baconian morality of science and return to the Copernicusion on morality. Science, for Copernicus, was the unified knowledge of the mechanical, the moral and the aesthetic, all of which must simultaneously be present in order to make sense of the cosmos.

Modern physics has shattered the principal concepts of the Newtonian world view, i.e. the notion of absolute space and time. Capra (1983) has attempted to answer one of the interesting and foremost questions of today—How is physics the most material of all sciences drawing close to philosophy? The very fact that, according to the Quantum principle, the observer cannot be separated from the observed as he is a participant, even if he has to observe as minute a thing as an electron, he must reach it—this idea of a participatory universe has been known in philosophy. Knowledge can never be obtained just by observation but by full participation with one's whole being. The subject and object are one.

Modern problems faced by us seem to be the result of emphasis on the mechanistic Cartesian view of the world. However, at this point, it is important to add that Maslow in his book *Psychology of Science—A Reconnaissance* (1966) has hastened to add that mechanistic science is not incorrect but rather too narrow and limited to serve as a general philosophy.

Another amazing instance where physics, the most material of all sciences, is shown to be drawing close to philosophy is provided by Jones (1983). He says, "the child, science, had earlier outgrown and rejected its parent, natural philosophy, which languished in a slow death."

So now, our thinking is changing and, in fact, a new term 'Biodance' has been coined to explain that the body is not an isolated self-contained unit but is in a dynamic relationship with the universe through this physical exchange (Dessey, 1982).

The comment that can be made on the new emerging science of wholeness is that the 'situation can perhaps be compared to Renaissance when the first modern scientist and great theoreticians—Copernicus, Galileo and Newton broke out of the labyrinths of medieval theology. That revolution took hundreds of years to unfold. This one could take only decades.' There is a looking glass theory which suggests that in biology transplants are possible precisely because of the holistic nature of the body and not because the body is a collection of inter-changeable parts (Briggs and Peat, 1985).

After discussing all these alternatives, most of us may think that the scientific study is the opposite and contradiction of the sense of mystery. But this need not be the case. For instance, while studying the physiology, the chemistry and the physics of the kidney—the more one learns, the more he marvels at its beautiful intricacy and simplicity and its functionally perfect form. Science at its highest level is ultimately the organisation of the systematic pursuit of, and the enjoyment of, wonder, awe and mystery, i.e. the peak experiences and recognitions of Maslow's self-actualised people.

### *Alternatives within a Perspective of Education*

Even though education is a distinct discipline, it does draw its sustenance from other fields such as sociology, philosophy, science and psychology. Alternatives and explosion of knowledge in different disciplines have challenging implications for both theory and practice in education.

Now-a-days some people are voicing their concern that the crises faced today—unemployment, energy crisis, pollution and other environmental disasters—are different facets of the same reality and this crisis is essentially a crisis of perception. It derives from the fact that we are trying to apply the concepts of an outdated world-view—the mechanistic world-view of science to a reality that can no longer be understood in terms of these concepts. So today it seems that perhaps we could leave some of the discoveries of science in the realm of pure knowledge and just for teaching purposes.

This is because, paradoxical though it may sound, the system that modern Man has produced is the one in which the most dispensable element is man himself. The earlier and later alternative concepts in science and psychology have a great bearing on education, e.g. in biology, the earlier Cartesian view of the living organisms was of machines, constructed from separate parts. Biologists were busy dissecting the human body down to its minute components and in doing so were gathering a body of knowledge about cellular and molecular mechanisms but still did not know, for instance, how digestion took place or how homeostasis was maintained in the body. To put it more clearly, the emphasis was on science as a content rather than as a process. Biologists tried to solve the problems by reducing

them to their molecular level. Today, a few of them are feeling that molecular biology may be reaching the end of its usefulness and what is needed is a systems, ecological view of life. In fact, a premise chart provided by some biologists for the coming years shows that by the mid-twenty-first century, we might have suspended animation of life, complete control of the aging process and man-made immortality. But the final question to be asked is: Does mankind have the collective wisdom to properly handle such knowledge?

In psychology, it is seen that the science of psychology has been far more successful on the negative side than on the positive side; it has revealed much about man's shortcomings, his illnesses, but little about his potentialities. Even the very idea of intelligence measurement is reductive (Gould, 1984).

As Laing has said, a child born today stands a ten times greater chance of being admitted to a mental hospital than to a university .... This can be taken as an indication of the fact that we are driving our children mad more effectively than we are genuinely educating them. Perhaps it is our way of educating them that is driving them mad. Thus, it is only a carefully planned educational system which is designed to correlate the alternative structures, applications and achievements of science and psychology that may serve as a redeeming feature. In the same way as we teach a human being to walk and to talk, we may have to teach children to be happy and to be better integrated socially in a world of love and companionship.

Till today, the concept of good teaching has been based on the mechanistic model drawn from atomic physics and behaviouristic psychology. So for generations, teacher-education institutions have operated on the basis of this concept. Thus, teaching has got atrophied. Humanistic orientation of psychology and the holistic view of science have their counterparts in education—holistic, humanistic integration—and also have implications for education that are enormous and far-reaching philosophically, orientationally, professionally, organisationally and educational socially.

*Philosophically*: An outline for an integrated pattern, approach and concept can be sketched as follows. Thus far, our philosophical tradition has concentrated on 'entities' rather than 'relationships'. Entities are seen 'in relation' rather than relationship, which is deeper and wider. The relevance of this basic tenet to learning is quite obvious. The patterns of child-teacher, child-child, child-teaching aid and learner-learned and the association of ideas gain from a relationship approach. The need is for a philosophy of education that is able to capture a person's complexity and individuality.

*Orientationally*: The orientation has to be towards a kind of education that is biased in favour of creation and growth, flexibility and development. In learning,

- (a) Self-regulation is to replace compulsion.

- (b) Co-operation is to replace competition: Here, co-operation means the tendency to behave as a meaningful part of a whole. The implications for primary schooling are tremendous. For instance, it is considered an offense for one child to turn to another for help with an arithmetic problem. This is 'copying' and has to be punished. But, it has been found that if this turning of one child to another is encouraged by teachers, all children improve, and the weaker children gain most. Thus, competition may continue, but as a game subservient to cooperation.
- (c) Education should be oriented towards
  - (i) Individuality (defined as complexity and richness)
  - (ii) Holism of mind, body and feelings.
  - (iii) Growth and self-actualisation as innate human characteristic.
  - (iv) Search for better and newer things.

There are implications for professional education, especially in the light of the alternative concepts in science and psychology. The unhealthy, prejudicial, conventional and narrow-minded environment in which children are raised largely precludes the humanistic development needed. For such development, we will need teachers who possess these humanistic characteristics, as the contention of humanistic psychology is: 'As the teacher, so the pupil'. Characteristics are autonomy, spontaneity, greater freshness of appreciation, perfection, wholeness, etc.

*Organisationally* : Within organic and inorganic patterns, there are relationships of hierarchies where the lower can only fully be understood as a part of the higher. This relates to the organisation in school as primary, secondary and higher secondary.

*Educational-Socially* : While man has been given the status of a 'resource', the New Education Policy, 1986 seems to have emphasised this aspect, e.g. the shift to functioning in a more creative learning environment rather than a teaching environment, i.e. the transition from teaching to learning in the process of education.

In fact, the new education through the influence of new psychology and new science is bringing about a complete over-hauling of the present perception of schools which are an extension of the model of a factory—the schools are expected to manufacture literacy and competence. But now the school is being visualised as an ecosystem (perhaps drawn from the similar concept in biology) (Datta, 1987).

Thus, the changes that are taking place are, in turn, the effect of certain transitions occurring as the human civilisation is progressing. A large number of changes have already been reviewed, but there are some others which are also very profound. One of the most influential transitions is due to the decline of patriarchy.



which has influenced our most basic ideas about human nature and about our relation to the universe—'man's' nature and 'his' relation to the universe—in patriarchal language. Now it is openly being challenged. It seems that the challenge to the inequalities that women have suffered in a man-dominated human civilisation, have also been a strong undercurrent influence of the rise of the alternative concepts. In fact, Feminism and Humanism are parallel movements (Nevill, 1977).

As one stands on the seashore, at the edge of a new tomorrow in control of the old knowledge and in possession of the exciting new knowledge that one is part of a wonderful nature, awareness becomes important. It is dawn and not midnight, and in the glittering light, everything becomes clear.

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# **Achievement of B.Ed. Students: Effect of Treatment, Intelligence, Attitude Towards Teaching Profession and Their Interactions**

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**T**HE objective of higher education cannot be achieved with the help of a single method or technique. Normally, it is seen that the lecture method dominates the teaching-learning process most of the time. In the lecture method the teacher is active while the students are passive. Generally there is one-way communication. The lecture method can be used effectively for giving information and thereby increasing the knowledge of the students. In the lecture method, there is no provision for knowing the extent to which the students have understood whatever has been said through this method. The science of teaching has grown

wherein new techniques have been developed. Further, it is observed that at the higher education level the students learn on their own and through interaction with men and material. In other words, self-learning and interaction constitute the main features of the teaching-learning process at the higher education level. There is enough evidence all over the world as well as in India that well-designed self-learning material, audio-visual package, etc. can communicate information more efficiently than an average classroom teacher, with considerable saving of time.

At the college level, programmed learning was found to be significantly superior to the traditional method (Bhushan and Sharma, 1975; Emery, 1981; and Sansanwal and Joshi, 1981). On the other hand, Bhushan (1973) and Govinda (1975) reported that Programmed Learning Material and Traditional Method were equally effective. Advance Organizer Material also was found to be significantly superior to Traditional Method (Richards and McCormick, 1977; Derr, 1978; Schwartz, 1980; Wilson, 1980; Lalli, 1980; Meena, 1980; Haghighi, 1980; Korzenowsky, 1981; Martin, 1981; Change, 1982; and Mahanaj, 1983). On the other hand, Advance Organizer Material and Traditional Method were found to be equally effective (Graber, Means and Johnsten, 1972; Caponecchi, 1973; Sowder et al., 1973; Callihan, 1976; Zakkour, 1977; Parisi, 1977; Solman, 1978; Morgonett, 1980; Singleton, 1980; and Lance, 1980).

The relationship between intelligence and achievement through Programmed Learning Material was studied by Bhushan (1973), Govinda (1975), Sansanwal (1977) and Menon (1984) at institutions of higher learning. They found positive and significant relationship between these two variables, except Menon (1984) who reported that intelligence was not related significantly with achievement. Relationship between intelligence and achievement through Advance Organizer Material has been studied by several researchers. Allen (1969); Varona (1978); and Choudhary and Buddhisagar (1981) reported positive and significant relationship between intelligence and achievement through Advance Organizer Material while Lucas (1972), Feller (1973), Sylves (1978), and Roper (1981) did not find any significant relationship between these variables. All of these studies, except Choudhary and Buddhisagar (1981), were done at the school level.

From the above presentation, it is evident that no study has been conducted where Programmed Learning Material (PLM), Advance Organizer Material (AOM) and Traditional Method are compared. Further, the influence of attitude towards the teaching profession on the achievement of the students studying through PLM, AOM and Traditional Method has not been studied. The interactional effects between treatment, intelligence and attitude towards the teaching profession on the achievement of the students have not been investigated so far. Keeping these gaps in mind, the present study was undertaken.

## OBJECTIVE

The objective was to study the effect of treatment, intelligence, attitude towards the teaching profession and their interactions on the overall achievement of the students.

## HYPOTHESIS

There will be no significant effect of treatment, intelligence, attitude towards the teaching profession and their interactions on the overall achievement of the students.

## SAMPLE

The present study was carried out at two stages. At the first stage instructional materials were developed. For this, 109 B.Ed. students admitted during the 1983-84 academic session in the University Teaching Department of Education, Devi Ahilya Vishwavidyalaya, Indore, were taken. This constituted the sample for the first stage. The students were at least second class graduates in Arts and Science. The official medium of instruction was Hindi. Majority of the students opted for the Hindi medium but some of them opted for English medium. In spite of this all the students possessed the competency to read and comprehend the material written in Hindi.

The sample for the second stage comprised of 139 students admitted during the 1985-86 academic session. These students were divided into three groups by the Department. The number of students in Groups I, II and III were 39, 55 and 45, respectively. All the male students were clubbed in Group III. Therefore, the male students were not available in Groups I and II. In each group, there were students from Science as well as Arts disciplines. There were graduates and post-graduates in these disciplines in all the groups.

## DESIGN

The study was designed on the lines of post-test control group design. There were three levels of treatment and three groups of students. The treatments were randomly assigned to the three groups. Group I received the treatment of Linear Programmed Learning Material, Group II received the treatment of Advance Organizer Material and Group III was given the treatment of Traditional Method. This group was termed as control group and other two groups were termed as

experimental groups. Intelligence and attitude towards the teaching profession were measured by using standardised tools. There were two levels of intelligence—high intelligence and low intelligence—and two levels of attitude towards the teaching profession—high favourable attitude and low favourable attitude.

## TOOLS

### *Intelligence*

Intelligence was measured with the help of the Advance Progressive Matrices developed by Raven (1971). It comprised of Set I and Set II. Set I covers all the intellectual processes covered by Standard Progressive Matrices Sets A, B, C, D and E. With adults, it can be used as a short 10-minute test. It is also used as a practice test before starting Set II. Set II provides a mean of assessing all the analytical and integral operations involved in the higher mental thought processes and differentiates closely between people of even superior ability. Set I comprised of 12 items while Set II consisted of 36 items. There was no time-limit for the test. The test-retest reliability coefficient was 0.91.

### *Attitude Towards the Teaching Profession*

Attitude towards the teaching profession was measured by using an attitude scale developed by Katti and Bannur (1974). The attitude scale was developed on the lines of the Likert type summated ratings. The scale was developed for the secondary school teachers. It consisted of 40 statements with a five-point scale. The subjects were to read the statement and select one out of the five options given against each statement. The five choices were: Strongly Agree (SA), Agree (A), Undecided (UD), Disagree (D), and Strongly Disagree (SD). The split-half coefficient of reliability was found to be 0.76, while the self-correlation of the scale in full length was found to be 0.96.

### *Achievement*

The achievement of the students was measured with the help of the criterion tests developed by the investigator.

## PROCEDURE FOR DATA COLLECTION

The treatments were randomly assigned to the groups. Group I was given the treatment of Programmed Learning Material, Group II Advance Organizer Material and Group III Traditional Method. Before starting the experiment the students

of all the three groups were taught the basic concepts of Educational Psychology through the Traditional Method. Each student of Group I was given a copy of PLM. In the same way, each student of Group II was given a copy of AOM. They were given one week for the first unit. The students of Group III were taught the same unit through the Traditional Method. At the end of the week the first criterion test was administered to all the three groups. The students of Group I studied the second unit through PLM, Group II through AOM, and Group III through the Traditional Method. They were also given one week to complete studying the second unit. On the completion of the second unit, the criterion test II was administered to the students of all the three groups. The same procedure continued for the remaining two units. In order to know the overall effect of the material, average percentage for each student of the three groups was calculated. During the experimentation the students of all the three groups were administered Advance Progressive Matrices and Attitude Towards Teaching Profession Scale as and when the time was available.

#### STATISTICAL TECHNIQUE

The data were analysed with the help of the  $3 \times 2 \times 2$  Factorial Design Analysis of variance of unequal cell size.

#### RESULTS

From Table 1, it can be observed that F-value for treatment is 50.37 which is significant at 0.01 level, with df equal to 2/127. It reflects that the mean achievement scores of the students belonging to the three treatment groups differ significantly. So the null hypothesis that there will be no significant effect of treatment on achievement is rejected. Thus, treatment produced differential effect on the overall achievement of the students.

Although the F-value is significant, yet it does not tell which group mean overall achievement score differs significantly from the other. This can be known by analysing the data using t-test. The results of t-test are given in Table 2.

The t-value between the PLM and AOM groups is 2.60 (vide Table 2) which is significant at 0.05 level, with df equal to 92. This indicates that the mean overall achievement scores of the students taught through PLM differ significantly from those taught through AOM. The mean overall achievement score of the students belonging to the AOM group is significantly higher than that of the PLM group. Thus, AOM was found to be superior to PLM in terms of the overall achievement of the students.

**TABLE 1**  
**Summary of  $3 \times 2 \times 2$  Factorial Design Analysis of Variance for Overall Achievement**

Source of Variation	df	SS	MSS	F-value
Treatment (A)	2	13396.53	6698.26	50.37**
Intelligence (B)	1	3246.01	3246.01	24.42**
Attitude Towards Teaching Profession (C)	1	27.63	27.63	< 1
A $\times$ B	2	1040.02	520.01	3.91*
A $\times$ C	2	74.75	37.37	< 1
B $\times$ C	1	538.58	538.58	4.39*
A $\times$ B $\times$ C	2	114.71	57.35	< 1
Error	127	16888.60	132.98	
<b>TOTAL</b>	<b>138</b>			

\* Significant at 0.05 level    \*\* Significant at 0.01 level

**TABLE 2**  
**Mean, Standard Deviation and t-values for Overall Mean Achievement Scores of Groups Using PLM, AOM and Traditional Method**

Groups	N	M	$\sigma$	PLM	AOM	TM
PLM	39	64.49	13.74		2.60*	6.07**
AOM	55	71.54	11.73			10.05**
TM	45	47.01	12.44			

\* Significant at 0.05 level    \*\* Significant at 0.01 level

It is also evident from Table 2 that the t-value between the PLM and TM groups is 6.07. This t-value is significant at 0.01 level, with df equal to 82. This indicates that the mean overall achievement score of the students taught through PLM is significantly different from those taught through TM. The mean overall achievement score of the students taught through PLM is significantly higher than those taught through TM. This reflects that the PLM group benefitted more in comparison to the TM group. Thus, PLM was found to be significantly more effective as compared to TM.

It can also be observed from Table 2 that the t-value between the AOM and TM groups is 10.05. This t-value is significant at 0.01 level, with df equal to 98. This indicates that the mean overall achievement scores of the students taught through



AOM is significantly different from those taught through TM. The mean overall achievement score of the students taught through AOM is significantly higher than those taught through TM. This reflects that the AOM group benefitted more in comparison to the TM group. Thus, AOM was found to be significantly more effective as compared to TM.

#### *Effect of Intelligence on Overall Achievement*

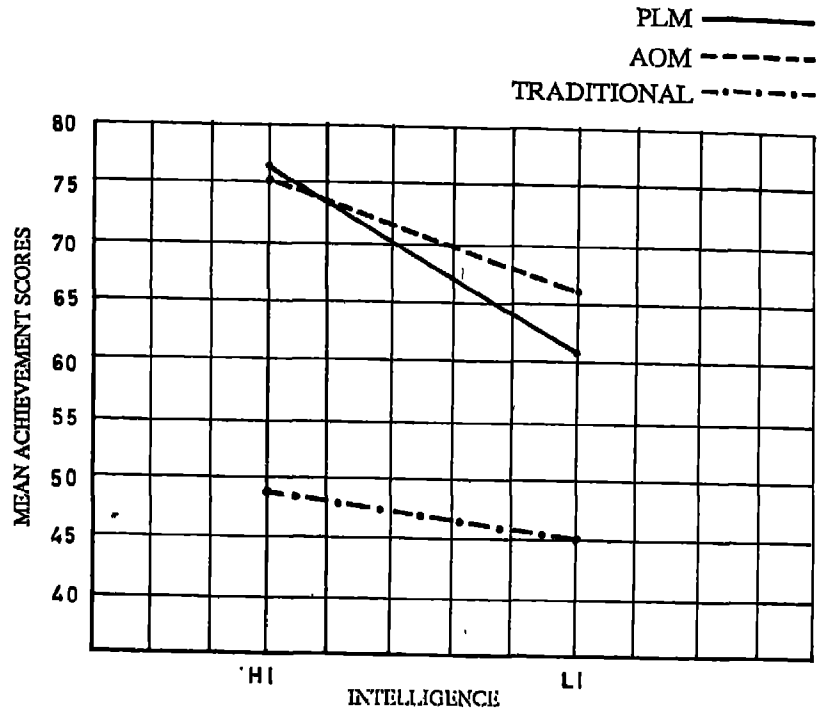
The F-value of 24.41 for intelligence is significant at 0.01 level, with df equal to 1/127. This shows that the mean overall achievement of the students belonging to two levels of intelligence—high intelligence and low intelligence—differs significantly. The mean overall achievement score of the high intelligence group is significantly higher as compared to the mean achievement score of the low intelligence group. That is to say, the students of high intelligence are likely to achieve high. So intelligence was found to influence the overall achievement of the students. Therefore, the null hypothesis that there will be no significant effect of intelligence upon the overall achievement of the students is rejected.

#### *Effect of Attitude Towards Teaching Profession on Overall Achievement*

The F-value for attitude towards the teaching profession is less than one (vide Table 1) which is not significant. This indicates that the mean overall achievement of the students belonging to high favourable attitude and low favourable attitude did not differ significantly. Thus, attitude towards the teaching profession did not significantly influence the overall achievement of the students. Thus, the null hypothesis that there will be no significant effect of attitude towards the teaching profession upon the overall achievement of the students is not rejected.

#### *Effect of Interaction Between Treatment and Intelligence on Overall Achievement*

The F-value for interaction between treatment and intelligence is 9.91 (vide Table 1) which is significant at 0.05 level, with df equal to 2/127. This indicates that the interaction between treatment and intelligence produced significant effect on the overall achievement of the students. Thus, the null hypothesis that there will be no significant effect of interaction between treatment and intelligence on the overall achievement of the students is rejected. In order to see the trend, the interaction has been plotted in Graph 1. From the Graph, it can be observed that with the decrease in the intelligence of the students there has been sharp decrease in the mean overall achievement of the students taught through PLM as well as those taught through AOM. But there is slight decrease in the mean overall achievement of the students taught through the Traditional Method, though not



GRAPH 1: INTERACTION BETWEEN TREATMENT AND INTELLIGENCE

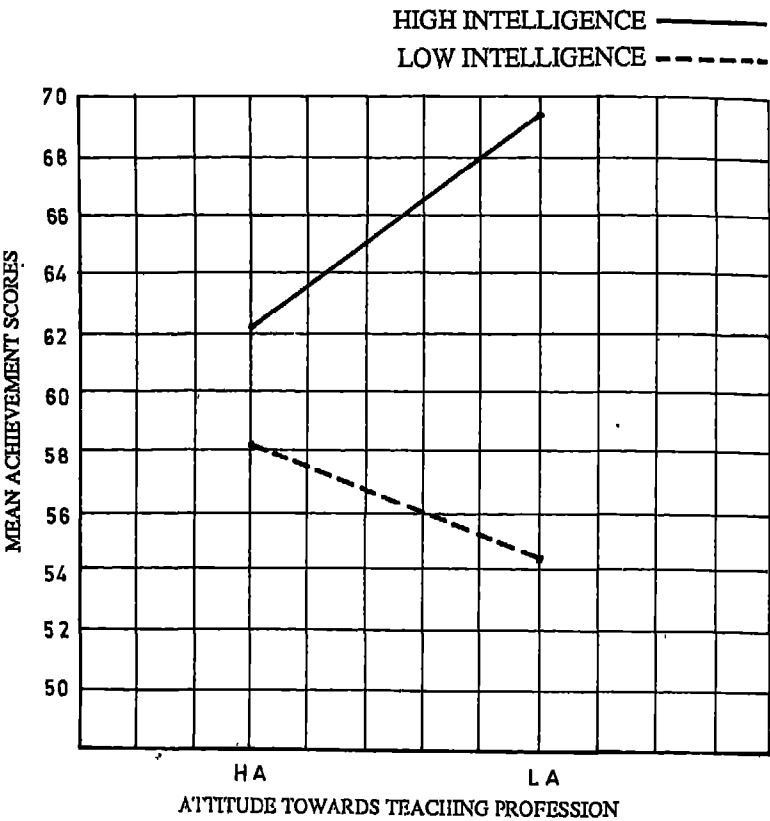
sharply as the intelligence of the students decreases. From this it is evident that high intelligent students can be taught with equal efficiency either through PLM or AOM. But low intelligent students can be taught effectively through AOM in comparison to PLM. It may, therefore, be said that low intelligent students may be taught effectively with the help of the instructional material developed on the basis of the Advance Organizer Model while high intelligent students may be taught effectively with the instructional material developed either on the basis of the Operant Conditioning Model or the Advance Organizer Model.

*Effect of Interaction Between Treatment and Attitude Towards Teaching Profession on Overall Achievement*

The F-value for interaction between treatment and attitude towards the teaching profession is less than one (*vide* Table 1). This value is not significant. It means that there has been no significant effect of interaction between treatment and attitude towards the teaching profession on the overall achievement of the students. In the light of this the null hypothesis that there will be no significant effect of interaction between treatment and attitude towards the teaching profession on the overall achievement of the students is not rejected. It may, therefore, be said that students with high as well as low favourable attitude towards the teaching profession can be taught equally well through the instructional material based on the Advance Organizer Model, the Operant Conditioning Model, and the Traditional Method.

*Effect of Interaction Between Intelligence and Attitude Towards Teaching Profession on Overall Achievement*

From Table 1, it can be observed that the F-value for interaction between intelligence and attitude towards the teaching profession is 4.39 which is significant at 0.05 level, with df equal to 1/127. It reflects that the interaction between intelligence and attitude towards the teaching profession produced significant differential effects on the overall achievement of the students. So the hypothesis that there will be no significant effect of interaction between intelligence and attitude towards the teaching profession on the overall achievement of the students is rejected. The F-value of interaction between intelligence and attitude towards the teaching profession does not tell about the trend of the effect of this interaction on the overall achievement. In order to find out the trend of the effect of interaction between intelligence and attitude towards the teaching profession, the interaction has been plotted in Graph 2. From the graph, it may be observed that as the degree of favourable attitude towards the teaching profession decreases, the overall achievement of high intelligence students increases sharply. On the other hand, in



GRAPH 2: INTERACTION BETWEEN INTELLIGENCE AND ATTITUDE TOWARDS TEACHING PROFESSION

the case of low intelligent students the overall achievement decreases as the degrees of favourable attitude towards the teaching profession decreases. Nevertheless, the difference in the mean overall achievement of high and low intelligent students having low favourable attitude towards the teaching profession is higher than those having high favourable attitude towards the profession. The students with high intelligence and low favourable attitude towards the teaching profession are likely to achieve high as compared to the students with high intelligence and high favourable attitude towards the teaching profession. This trend is reversed in the case of low intelligence students.

*Effect of Interaction Between Treatment, Intelligence and Attitude Towards Teaching Profession on Overall Achievement*

The F-value for interaction between treatment, intelligence and attitude towards the teaching profession is less than one (*vide* Table 1) which is not significant. This indicates that there was no significant effect of interaction between treatment, intelligence and attitude towards the teaching profession on the overall achievement of the students. So the hypothesis that there will be no significant effect of interaction between treatment, intelligence and attitude towards the teaching profession on the overall achievement of the students is not rejected.

## DISCUSSION

*Effect of Treatment on Achievement*

The Advance Organizer Material was found to be significantly superior to the Programmed Learning Material in terms of the students' achievement. This finding is not supported by Lemke (1980) who compared the effectiveness of the Programmed Instruction technique and a technique using Advance Organizer and study question as ancillary learning activities for brass technique classes at the college level. Programmed Instruction was found to provide more effective learning than that taking place through the use of a study guide using Advance Organizer as an ancillary method of instruction.

The Programmed Learning Material was found to be significantly superior to the Traditional Method. This finding is in line with (Aven, 1970; Bhushan and Sharma, 1975; Nalliah and Adinarayan, 1977; Elerian, 1978; Mohant, 1979; Shitole, 1979; Gupta and Gupta, 1979; Dcan, 1980; Sansanwal and Joshi, 1981; Emery, 1981; Gupta, 1983 and Kumar, 1983).

The Advance Organizer Material was found to be significantly superior to the Traditional Method. This finding is in line with (Stenbrink, 1970; Smith, 1976;

Richards and McCormick, 1977; Alexander, 1977; Derr, 1978; Thompson, 1978; Schwartz, 1980; Wilson, 1980; Lalli, 1980; Meena, 1980; Giles, 1981; Haghighi, 1981; Korzenowski, 1981; Martin, 1981; Alverman, 1981; Change, 1982; Mahajan, 1983; and Chitriv, 1983).

### *Effect of Intelligence on Achievement*

Intelligence was found to effect significantly the overall achievement of the students. The highly intelligent students were found to achieve high. The relationship between academic achievement and intelligence has been explored from the eighth grade to the college level (Jha, 1970; Vanarase, 1970; Choudhary, 1971; Dhaliwal, 1971; Passi, 1972; Pathak, 1972; Thakur, 1972; Gupta, 1973; Rai, 1974; Shrivastava, 1974; Bayati, 1975; Lalithamma, 1975; Seetha, 1975; Mathew, 1976; and Shrivastava, 1976). All of these studies reported a positive and significant relationship between academic achievement and intelligence, except Choudhary (1971) who reported a positive and significant relationship between two variables in the case of females, whereas no relationship was found to exist between these two variables in the case of male subjects.

At the graduate and post-graduate levels, six studies were conducted (Mishra, 1962; Singh, 1965; Ram Kumar, 1969; Reddy, 1973; Sudame, 1973; and Kumariah, 1976) to explore the relationship between academic achievement and intelligence. All the investigators have reported a positive and significant relationship between these two variables, except Mishra (1962) who found these variables to be unrelated to each other.

On the basis of the studies reported above, it may be said that intelligence is a factor which significantly influences the achievement of students.

### *Effect of Attitude Towards Teaching Profession on Achievement*

It was found that attitude towards the teaching profession did not influence the overall achievement of the students. According to Good (1973), attitude is the predisposition or tendency to react specifically towards an object, situation or value, usually accompanied by feelings and emotions. Attitude is developed over a long period of experience and interactions with different objects or events. In the present study all the subjects had favourable attitude towards the teaching profession although the degree of favourableness varied. The treatment time was not long enough to change the attitude of the students towards the teaching profession, so the students of both the groups might have been benefitted equally through the treatment.

*Effect of Interaction Between Treatment and Intelligence on Achievement*

It was found that there was a significant effect of interaction between treatment and intelligence on the overall achievement of the students. Further, it was found that low intelligent students could be taught effectively with the help of the instructional material based on the Advance Organizer Model whereas high intelligent students may be taught effectively with the instructional material based on the Operant Conditioning Model as well as the Advance Organizer Model. Intelligence is an ability which plays a role in all walks of life. In this way, it has played a role while learning through the instructional materials.

The Advance Organizer Material might suit both high as well as low intelligent students because the Advance Organizer given in the beginning of the learning material strengthens the cognitive structure and through it, the information gets linked with the previous information possessed by the learner. The Advance Organizer provides the Gestalt view of the information to be learned which ultimately helps in comprehending it. On the other hand, in the instructional material based on the Operant Conditioning Model the information was presented in small steps. In order to understand the information the prompts were used. The prompts were slowly withdrawn so that the students could apply their intelligence and understand the information presented in the frame. Since intelligence was essentially required to understand the content presented in the Programmed Learning Material, the high intelligent students were benefitted more as compared to the low intelligent students. These may be the reasons for the above-mentioned findings.

*Effect of Interaction Between Treatment and Attitude Towards Teaching Profession on Achievement*

No significant effect of interaction between treatment and attitude towards the teaching profession on the overall achievement of the students was found. The achievement of the students comes under the cognitive domain whereas their attitude towards the teaching profession comes under the affective domain. In the present study, the students belonging to the three groups had favourable attitude towards the teaching profession, although the degree of favourableness varies. The students having favourable attitude towards the teaching profession are likely to have interest in learning Educational Psychology which helps them to become better teachers. The interest of the students in the subject may help them to understand the content related to the subject, irrespective of the mode of its presentation. The students learning through the Programmed Learning Material, the Advance Organizer Material and the Traditional Method might have learned the content of Educational Psychology with the same concentration. These might be the reasons for the present findings.

*Effect of Second Order Interaction on Achiever.*

The second order interaction was interaction between intelligence and attitude towards the teaching profession. The significant effect of interaction between intelligence and attitude towards the teaching profession on the achievement of the students mentioned earlier that intelligence did not have a significant effect towards the teaching profession, though it may be that students with high and low favourable attitudes may achieve equally well. The same may hold good for low and low favourable attitude.

CONCLUSIONS

On the basis of the results and the discussion, the following conclusions are drawn:

1. The Instructional Material based on the Advance Organizing Model was found to be significantly superior than the Traditional Method. Further, the Instructional Material based on the Operant Conditioning Model was also found to be significantly superior to the Traditional Method.
2. Intelligence was found to have a significant effect on the achievement of the students. The highly intelligent students achieved significantly higher scores than the low intelligent students.
3. Attitude towards the teaching profession had a significant effect on the overall achievement of the students.
4. There was a significant effect of interaction between intelligence and attitude towards the teaching profession on the overall achievement of the students. It was found that low intelligent students may be taught better by the Instructional material developed on the Advance Organizing Model, whereas high intelligent students may be taught better by the instructional material developed on the Traditional Method as well as the Advance Organizing Model.
5. There was no significant effect of interaction between intelligence and attitude towards the teaching profession on the achievement of the students.
6. There was significant effect of interaction between intelligence and attitude towards the teaching profession on the achievement of the students. Further, it was found that as the intelligence increases, the attitude towards the teaching profession decreases.



high intelligent students increased sharply, while in the case of low intelligent students it decreased sharply.

7. There was no significant effect of interaction between treatment, intelligence and attitude towards the teaching profession on the overall achievement of the students.

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## Guilford's SOI Model as a Function of Cognitive, Psychomotor and Affective Abilities

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**G**UILFORD (1977a) modified the SOI model which was proposed in 1967 as 'Nature of Human Intelligence'. In the former model, he developed 120 intellectual abilities based on the three-dimensional interpretation of intellect formulating a  $4 \times 5 \times 6$  matrix. The present model deals with the  $5 \times 5 \times 6$  matrices of 150 intellectual abilities with the addition of one more category of auditory in the second dimension, i.e. under the category of content, 'figural'. Thus, the content 'figural' was divided into two categories: (1) visual, and (2) auditory. A very few such abilities had been reported, such as two factors evolved by Fleishman, Roberts and Friedman (1958). The two categories were included under: (1) auditory figural, and (2) visual figural in an early account (Guilford, 1977a) as

seen in Fig. 1. Feldman (1969) had explored further evidence for the auditory factors and Horn (1973) presented evidence about five such factors, all of which were logically incorporated into the system of SOI.

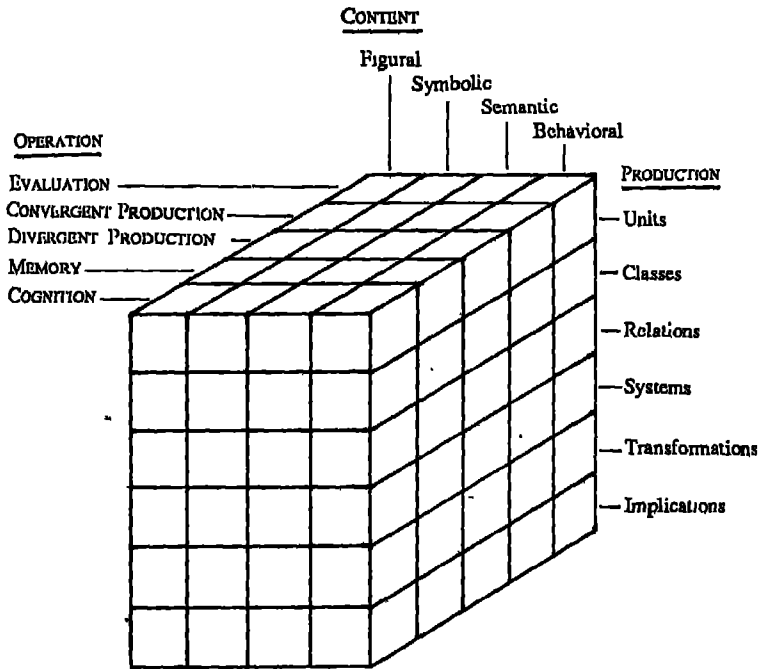


FIG 1. Guilford's Structure of Intellect Model (SOI Model):  $4 \times 5 \times 6 = 120$  Mental Abilities (Guilford, 1967)

### RATIONALE OF THE SOI MODEL

The grouping of abilities into three different ways was referred to as "cross-classification" in three dimensions. When visually conceived, the SOI model appeared to be a cubical one (see Fig. 1). The three-dimensional view of the model is sometimes called a morphological model. Mathematically speaking, perhaps it

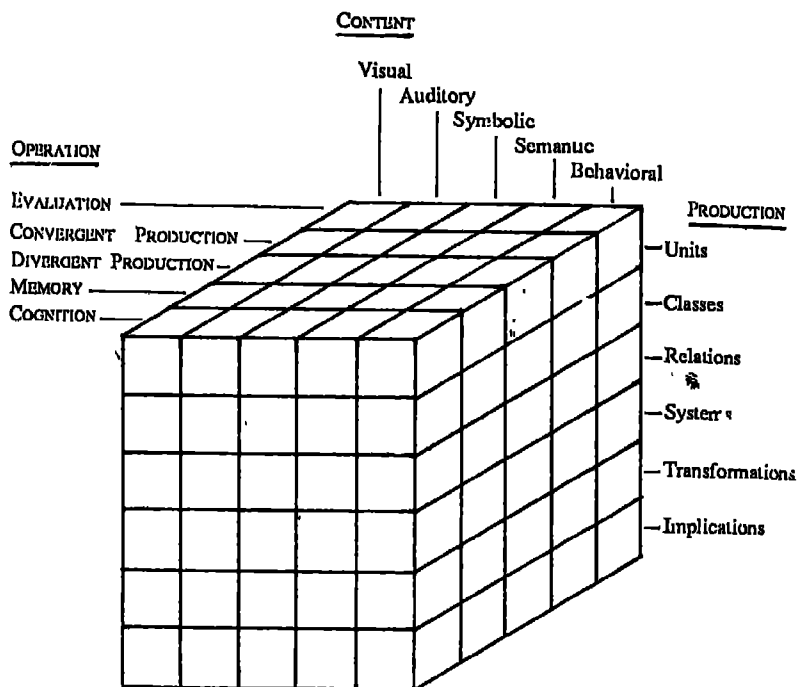


FIG. 2 Guilford's Structure of Intellect Model (revised version, 1977ab) may be defined in terms of 150 intellectual abilities ( $5 \times 5 \times 6 = 150$ ). A review of the relative literature reveals that the content categories—visual and auditory and symbolic—represent the type of psychomotor domain abilities, whereas the semantic category demonstrates the cognitive type. Finally, the behavioural category shows the affective domain abilities. Thus the SOI Model may be defined as a function of the cognitive, psychomotor and affective domain abilities.

merits as a product of sets. What leads to the proposition of the model was that Spearman had found evidence for "psychological content" a category of information and E.L. Thorndike (1920) had debated vigorously for "social intelligence" that would lead to the mental status of others. It was hypothesized that this domain would have the same kind of mental abilities as had already appeared in other



categories of information processing. Later analyses have furnished evidences that support the above contention (Handricks, Guilford and Hoepfnor, 1969; O'Sullivan and Guilford, 1975). Actually, Guilford (1959) had added the fourth category of behavioural content that raised or gave birth to 30 more intellectual abilities.

## NATURE OF HUMAN INTELLIGENCE

The nature of human intelligence reveals that "intelligence may be defined as a systematic collection of mental abilities or functions for processing informations of various kinds (forms)". The term 'ability' is used to explain the nature of individual difference, whereas the functions refer to the ways of behaving individual. Thus, in this manner the two major psychologies known as 'bivariate experimental' and 'multivariate experimental' come into play to enrich the field of cognitive psychology.

As is evident from the definition, each basic ability is identified by its conjunction of three variables or facets. Each ability possesses the unique kind of a mental activity in terms of operation, informational content and informational product to formulate a particular mental set of information, i.e. product. The concept of product is selected in such a manner that the brain has to produce it in its own kind of structure.

It is clear from the structure of the intellect model that the rows going one way demonstrate the kinds of contents, e.g. visual auditory, symbolic, semantic and behavioural. The rows going the other way envisage the kinds of products, i.e. units, classes, relations, systems, transformations and implications. The three-dimensional structure of the model has been a difficulty for conducting factor analysis.

In the SOI model, the abilities are formulated by operating the content over the products, one by one, to list the mental abilities. For example, the three-letter symbol CVR (cognition of visual relations) is commonly found in the "multiple choice figural analogies test". The term MSS (memory of symbolic systems) is seen in the common memory span tests. Likewise, the three-letter symbol EMC (evaluation of semantic classes) is observed in a test that calls on an examinee to accept or reject a set of word meanings as related to the same class. In order to avoid any duplication, the symbols have been codified by another letter where they have the same beginning letter, e.g. convergent production is symbolized by N (C is for cognition) and M for semantic (because S stands for symbolic).

The order of the three letters is always read as: (1) operation, (2) content, and (3) product.

## SOI CATEGORIES DEFINED

According to J.P. Guilford (1982), if it is believed that since the SOI categories are unambiguous and operationally defined, it is incumbent on the researcher to state those definitions very explicitly.

## KINDS OF OPERATIONS OR MENTAL PROCESS COGNITION

The terms related to operation may be specifically defined as follows:

1. *Cognition* : It refers to the process of structuring the items of information by the brain. It may further be termed as knowing, comprehending or discovering the items of information, such as knowing the meaning of the word 'love' or seeing that the red colour of the patch is in the form of a cow, or the sky is blue.

2. *Memory* : This term refers to the process of bringing the cognized items of information for storage in the brain with persistence at least beyond the moments of activation or direct stimulation. For example, memorizing a telephone number, or the license number of an automobile, or a recipe, etc. This process does not consist of retrieving items of information from the storage. The latter activity refers to one or two of other SOI operations due to be stated next.

3. *Divergent Production* : The process of generating a number of items of information from the memory repertoire, either in the form of verbatimism or in modified form, satisfying a need of a set of significant needs, is known as divergent production. In brief, the thinking involving the ideas based on diversified approaches which led to thinking in alternative directions is termed as divergent thinking (Yadav, 1982, 84). For example, naming of objects that have properties of hardness and edibility or to present different titles for a story based on its theme. This process leads to a specialized class of elements retrieving (process) from the memory storage; and as such is identified by the individual differences (age, sex, intelligence aptitude, etc.) in test scores when whole class specifications are given (Christensen and Guilford, 1963). Yadav (1982, 1984) termed it as an important type of thinking process whereby ideas progress in different directions because one does not reach a right solution of the problem. The flow of ideas from the memory repertoire gives rise to divergent production. It really activates the neurons of a member of alternative ideas reflecting a theme.

4. *Convergent Production* : The process of retrieving from the memory repertoire a particular, fully specified item of information, such as thinking of a special word or a theme to fit it into the given system with its meaningfulness is defined as convergent thinking (Yadav, 1982, 84). A convergent product should be full of relevance, meaningfulness and validity leading a definite theme relating to the items of information (Yadav, 1982, 1984). For example, fitting a correct word in

a crossword puzzle, drawing a substantial conclusion from the story 'Sherlock Holmes'. One may observe such events to be peculiar, i.e. retrieving items of information from the memory collection but it should involve different psychological functions. In contrast, factor analysis consistently shows it to be the case of a special class. Guilford (1986) states that one of the functions involves a broad search, as reviving the number of a class, whereas the other entails a focussed search for a particular class member.

**5. Evaluation :** The process of appraising the worth of a variable, quality or theme is known as evaluation. Really, it consists of two processes: (1) measurement, and (2) value judgement. It is qualitative in nature. Guilford (1986) states that it is the process of deciding whether or not, or how well a certain item of information satisfies certain logical requirements. For example, deciding whether an incomplete circle will pass through a given point, if it is completed. This operation does not apply to aesthetic judgements or choices (Hoffman, Guilford, Hopfner and Doherty, 1968) maintains that it is not known whether it applies to moral judgements, but it should theoretically apply to the judgements of reality of behavioural events and to legal decisions. However, a logical analysis of Guilford's contention on evaluation and D.R. Krathwohl et al. (1964)'s contention on characterization reveal that evaluation makes judgement about the cognitive functions, whereas the process of characterization (an affective domain ability) appraises the worth of affective abilities in reference to meeting high standard of excellence.

Hence the following hypothesis is advanced to test the level of significance as regards thinking on cognition and characterization:

The judgements made about the things, events or attributes, concepts, theories, laws, etc. are based on the nature of things, considering the criterion of validity. For example, the decision about cognitive abilities is based on the concreteness of the content governed by the reality: the decision about psychomotor abilities is based on the efficiency of the operation it performs; and finally the decision about the affective domain abilities is based on moral judgement, keeping in view the standard of excellence. The point of view here is to highlight the frame of reference in which an event or an idea is interpreted.

#### CONTENT CATEGORIES: INFORMATIONAL SUBSTANCES

The real subject matter which is communicated to the learner is the content, a well-defined content. There are different kinds of contents:

**1. Visual :** It defines a set of information arising directly from the stimulation of the retina or indirectly from the images of the same character (Guilford, 1985, 1977a).

2. *Auditory* : This type of content refers to a set of information coming from the direct stimulation of receptors in the cochlea of the inner ear or indirectly in the shape (form) of the same nature (Guilford, 1977a).

3. *Symbolic* : It refers to the type of items of information that usually stand for other kinds of items by brief notations, e.g. 'Au' for gold, 'Ag' for silver, etc. Other examples include 'digits' or letters and their combinations; a basis for defining mathematical functions and notations in science, art, literature, etc.

4. *Semantic* : It is a type of content that relates to the meaning of the words, connotations to the symbols. It is a branch of philosophy relating to the word meanings. Guilford (1986) admits it as meanings of the words in usual manner, but not always attached to the word symbols.

5. *Behavioural* : This type of content deals with the items of information that speak about the mental state and behaviour of individuals, usually expressed by their actions and language. Guilford (1986) contends the abilities involving behavioural informations provide a "social intelligence", long ago proposed by E.L. Thorndike (1920).

#### PRODUCT CATEGORIES : KINDS OF INFORMATION FORMS

Product is defined as the resultant of information between the operation and the content, i.e. the content is processed through the product categories through intellectual operations given earlier differ in kinds of the structures that the brain produces. The following types of products are arranged with the logic that they extend contribution in the formulation of a system of categories:

1. *Unit* : This is a type of product which is defined as an independent entity like an object possessing its unique combination of properties or attributes. Examples related to the units are blue triangular patch, sound of a musical chord, printed word, meaning of crime, a gene consisting of basic units (i.e. building blocks). Therefore, units are basic building blocks, just like the bricks which are the basic (entities) elements that shape a building.

2. *Class* : It is defined as a set of similar units having like properties or other kinds of products, even classes of a class. Suitable examples include—a set of rectangles, high pitched tones, words ending in 'ing', set of occupations. The words or attributes of similar shape, size and properties are grouped together and are termed as a class of objects or attributes.

3. *Relations* : Relations is a connection between two items based on similarities and dissimilarities. For example, Hari is taller than Mohan. Hence 'taller' sets up the relationship between Hari and Mohan. Other examples include—two tones or an Octave apart, two names in alphabetical order, Kamla married to Vishnu, Shyam is angry with Rama, etc.

4. *System*: It is defined as the coordinated planning of things; attributes, information, ideas, etc. in a meaningful manner (Yadav, 1982, 1984). When three or more items are interrelated in a recognizable whole, they formulate a system of items. So, a system is a comprehensive category by which the things based on their properties are classified together to give them a system. Major examples include arrangement of objects on one's desk, melody or rhythm, plan for a sequence of action or three or more persons interacting for a heroine. As a matter of fact, Guilford could not give it a comprehensive shape. Hence it leads to further classifications. Hence a hypothesis is evolved as follows:

A system leads to a coordinated planning resulting into meaningful ideas so as to systematize them. However, index of association, coefficients of correlations lead to a significant feature in the formulation of a system.

5. *Transformation*: It refers to any change or reshuffling in an item of information or into a set of information. Examples of this category include—substitution as in (ordinarily) visually perceived movement of an object, variation of melody, correction in misspelling, pun, or revised impression of a person's behaviour, etc.

6. *Implications*: According to Guilford (1986), implication refers to an item of information suggested by a given item of information. Examples of this category include—thunder following lightening, seeing  $4 \times 5$  and thinking its answer to be 20, hearing the word 'hell' and thinking its opposite 'heaven', or thinking what your drowning friend is likely to perform an excellent piece of work, etc.

However, the term 'implication' has been derived from the word 'implicate' which means 'lead to consequence or inference'. Thus the term 'implication' refers to a natural inference drawn or leading to the consequences which are meaningful to be applied in practicum. The consequences or inferences so derived, if utilized practically, refer to the implication in true sense. So it refers to more practical usage rather than theoretical conception.

This revised version of Guilford's SOI model generates  $5 \times 5 \times 6 = 150$  intellectual abilities that formulated in a sequence of operation, content and product, respectively. The position of  $4 \times 5 \times 6$  matrices structure (1967) was revised by Guilford (1977a) and as such it leads to 150 abilities. Notwithstanding the above 150 intellectual abilities, this SOI model leads to the generation of more intellectual functions, further serving the heuristic functions. The heuristic functions of the model give rise to the generation of new hypotheses leading to research and development of intelligence.

The product 'implication' was recommended as a substitute for that time-honoured concept of association by Guilford (1966b). Tolman (1932), the proponent of the Signgestelt theory of learning, maintained that instance of expectation (i.e. level of aspiration—a term related with motivation) is regarded as a source of

motivation. The same suggestion includes the conditioned response in line with those who regarded it as an instance of anticipation or expectation.

The most significant elements of the structure of the intellect model are classes, relations and systems. If these intellectual functions qualify, the interesting interpretation may be furnished about units, transformations and implications.

A critical study of related literature reveals that mathematics is such a subject that takes into account all types of intellectual abilities in working out solutions of the problem. Therefore, all six kinds of the products may be utilized in mathematics (Guilford, 1980b). It is further suggested that the brain operates according to a 'psychologic' (Guilford, 1966b). Although mathematics needs all types of visual, symbolic informations, it equally shares with all other kinds of intellectual functions, i.e. the same set of information of products. In mathematics, there is a significant beauty that it defines the terms with objectivity and precision, whereas in other content areas, the brain operates with what best it can do to interpret the things but comparatively in a less precise manner. The conclusion is that 'psychologic' is broader than mathematics.

In fine, considering only the kinds of content areas and products, one will attain a matrix of  $5 \times 6 = 30$  unique kinds of items of information(s) (rows of content and 6 rows of products). Guilford (1966b) suggested that such a set may be recognized as a "psychoepistemology" which is a kind of the thing the philosophers at one time were looking for, to evolve a theory of intelligence (i.e. of intellectual functioning).

## EDUCATIONAL IMPLICATIONS OF THE SOI MODEL

The SOI model may be utilized in a variety of ways. The comprehensive spectrum of intellectual abilities gives an insight into the various dimensions of intellectual functioning that they can be successfully employed in diversified educational tasks to test the feasibility of a system. The following are the significant areas where the SOI abilities may be tested.

### *1. Curriculum Development and Learning*

The use of SOI abilities depends upon the experience, knowledge and understanding of an expert, the way he operates the things. The curriculum experts may frame the curriculum, keeping in view the intellectual abilities but with special reference to age, sex and grade level of the learners. The SOI model furnishes a good list of intellectual functions to account for a type of curriculum to be framed.

## *2. Aptitude Test*

An aptitude is defined as a special ability of an individual in a particular field of endeavour. A person having interest and special intellect in a particular field of study is called talented or creative. The SOI model has a good list of intellectual abilities that may be selected carefully for the construction of an aptitude test for a particular subject or faculty but keeping in view the mental maturity of the learner, his sex, grade and age. Even the intercorrelations may be estimated between the intellectual functions and the related subject units of a particular discipline.

## *3. Preparation of Standard Books*

A thorough knowledge and understanding of the SOI model is likely to extend help in the writing of good books. Now-a-days emphasis is being placed on the testing of intellectual or mental abilities, based on a particular kind of content. The experts are more interested in testing mental abilities through content units. Therefore, if the content units (the building blocks of a subject) are arranged in terms of intellectual operations, it will help promote the standard of education. Moreover, the writing of standard books, mental abilities (such as furnished by Guilford, et al. 1984), will revolutionize teaching, learning and evaluation along with the elevation of the standard of academics. The questions of various categories should be arranged in order to intellectual abilities of lower to higher order.

## *4. Examination Reform and Emerging Trends*

Yadav (1981) states that, through the ages, the traditional Macauley system of holding three-hour examinations could not be replaced, in spite of excellent reports on education (1949, 1952-53, 1964-66, 1972, 1985 and 1986). The result is that students have become handicapped of gaining knowledge only. No account of subsequent hierarchically developed higher mental abilities (Guilford, 1966, 1977a, 1984; Yadav, 1984) has been extensively taken care of, in spite of the availability of well-defined researches. Hence, SOI abilities may be used while setting papers for different examinations. The present author has already proposed to prepare a blueprint in terms of content units and hierarchically defined mental abilities in order to establish validity and reliability of the examinations (Yadav, 1981, 1985).

## *5. Learning and Teaching*

Learning is a relatively permanent change in behaviour occurring as a result of reinforced practice and experience. In contrast, teaching is a way of guiding,

directing and modifying the behaviour of the learner to achieve well-defined objectives. If teaching-learning strategies (objectives, content units and material aid) are systematically arranged, based on intellectual functions as suggested by Guilford (1966ab; 1977ab, 1981, 1984) Yadav (1982, 1984, 1985, 1986, 1987, 1988, 1989), the process of both teaching and learning takes place effectively and this will, in turn, elevate the higher dimensions of teaching and learning.

### *6. Job Analysis*

The most wanted quality of an examination is to choose persons of suitable and desired abilities in order to run the system well. The SOI model contains a comprehensive list of general as well as specific abilities. Hence all types of tests may be constructed on selection of the type of abilities that belong to a particular group of abilities, related to the job, e.g. intelligence, aptitude, creativity, talent (science talent search examination) tests, etc. While selecting the persons for administrative or academic jobs (IAS, PCS, high executives, experts for particular assignments), SOI abilities may be successfully employed (Yadav, 1982).

### **FURTHER RESEARCH NEEDED**

So far nearly 100 intellectual abilities, out of 150 (mental abilities/processes), have been investigated and demonstrated through standard tools and techniques. There is still much need to focus attention on the validation of intellectual functions of still higher order. The following points are posed to the researchers while undertaking research problems in the field of cognitive domain:

1. The greatest need is for investigation in the auditory content area. In the content area pertaining to the category behaviour, there is need for conducting research on the analysis of abilities involving the operation of memory, convergent production and evaluation.
2. There may be an attempt to find out a whole set of discoverable functions in the areas of kinesthetic and cutaneous information.
- 3
  - (a) SOI abilities may be used to cover a wide range of motor functioning.
  - (b) Both motor and motivational functions can be revealed in terms of information-processing functions.
4. The comprehensive map of intellectual abilities reveals that assessment of individual status in intelligence is done in terms of profile of scores rather than a single, conglomerate of unrecognized composition.
5. An enlarged picture of development and of decline of intelligence and intellectual functioning is now available. Predictions of achievement, of behaviour of learning abilities, of faculty selection in various fields of



working, may be done well with the use of optimally weighted composite scored marshalled for the purpose.

In all the predictions and future prospects, intellectual abilities that represent a particular set of abilities may be grouped together and the SOI mental functions so derived from matrices equations may be representative of different kinds of tests. It was proposed by Yadav (1986, 1987) that the complex spectrum of 150 intellectual abilities may be studied significantly and meaningfully if the abilities are reduced and synthesized into a group of ten prototype abilities, each consisting of 15 or so. This will make the SOI model more suitable for learning and research.

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## Ph.D. Theses Abstracts

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### *Students' Perception of Teachers as a Function of Educational Level, Academic Achievement and School Background of Students*

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THE teacher plays a significant role in the teaching-learning process and makes immense contribution in fulfilling the goals of education. The success of a teacher in his pursuits, depends, besides other factors, upon the satisfaction of the receiving end. Good personality and abilities teachers may have and effective strategies, methods and techniques they may adopt in the classroom, will add to their effectiveness only if these are perceived so by the students. Hence, the perception of the students of their teachers is an important factor in making the teaching-learning situation effective. Thus there was a need to develop a students' perception scale, so that their perceptions of the teachers could be measured in a scientific way.

The analysis of a person's perception in a classroom situation shows that many of the perceiver's variables affect their perception of the teachers. Keeping the above-mentioned analysis of the process in the main body of the study, school background, educational level and academic achievement were taken as indepen-

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Ph.D awarded by Kumaun University (1988).

dent variables and their influences on the students' perception of the teachers were measured in the present study.

## PHASE I

In Phase I of the study, the qualities of a successful teacher as perceived by the students were found out and which helped in the construction of a tool for measuring the students' perception of the teachers in Phase II of the study. This provided a base for inter- and intra-school comparisons of the perceived qualities of a successful teacher.

## METHODOLOGY

Two types of schools, namely, public and government and three educational levels, i.e. middle, lower secondary and higher secondary were taken.

Cambridge School and Government Higher Secondary School No. 3, Sarojini Nagar, from South Delhi represented public and government school, respectively, on availability basis.

Classes VIII, X and XII were taken as representative of middle, lower secondary and higher secondary educational levels. Fifty randomly selected students of each educational level in each school were taken, making the total sample of 300 students.

## PROCEDURE

The study was conducted in three sessions, on different days, and at the same time in one school. The students were instructed to write at least 12 qualities of a successful teacher on a cyclostyled paper having instructions. A score of 12 for the first mentioned quality and a score of one for the last mentioned quality were awarded. The data collected were analyzed on the basis of the scores obtained. Fifty-four qualities emerged which were later classified into 16 broad categories by three teacher-educators.

## RESULTS

The 16 broad categories of qualities of a successful teacher as perceived by the students, with their rank order of preference are:

*Qualities of a Successful Teacher*

	<i>Rank Order of Preferences</i>
Uses appropriate strategies to make the lesson interesting and effective	1
Has a good temperament	2
Maintains discipline in the class	3
Uses good methods and techniques of teaching	4
Possesses knowledge of the subject taught	5
Is loving	6
Is kind	7
Has sound relationship with others	8
Is sincere	9
Provides guidance in personal problems of students	10
Is impartial and unbiased	11
Is punctual	12
Has knowledge of other subjects	13
Provides educational guidance	14
Provides guidance for future career	15
Is inspiring	16

The following are the results of inter-school comparisons:

1. The students of the public school considered 'maintains discipline in the class' as the most important quality of a successful teacher and 'is punctual' as the least important, while the students of the government school gave first priority to the quality 'uses appropriate strategies to make the lesson interesting and effective' and last priority to 'provides guidance for future career'.
2. At the middle educational level in the public school the qualities 'maintains discipline in the class' and 'is punctual' and in the government school, the qualities 'has a good temperament' and 'provides educational guidance' were considered as the most important and least important qualities of a successful teacher.

At the lower secondary educational level, the quality 'maintains discipline in the class' was the most preferred by the public school students, while for the

government school, it was 'uses appropriate strategies to make the lesson interesting and effective'. The quality 'is inspiring' was the least preferred quality by the students of both public and government schools.

At the higher secondary educational level, the public school students considered the quality 'possesses knowledge of the subject taught' as the most important and the quality 'is punctual' as the least important, while in the case of the government school the most important and least important qualities were 'is loving' and 'provides educational guidance', respectively.

The results of intra-school comparisons are given below:

1. In the public school the quality 'maintains discipline in the class' was the most preferred quality by the students of both the middle and lower secondary educational levels, while it was 'possesses knowledge of the subject taught' in the case of the students of the higher secondary educational level. The quality 'is punctual' was the least preferred quality by the students of the middle and higher secondary educational levels, while it was 'is inspiring' for the students of the lower secondary educational level.
2. In the government school, the most important qualities of a successful teacher as perceived by the students of the middle, lower secondary and higher secondary educational levels were 'has a good temperament', 'uses appropriate strategies to make the lesson interesting and effective' and 'is loving', respectively. The least important quality was 'provides educational guidance' at the middle and higher secondary educational levels and 'is inspiring' at the lower secondary level.

## PHASE II

On the basis of the findings and trends in Phase I of the study, a suitable tool for measuring the students' perception of the teachers was developed. With the help of the tool developed, the students' perception of the teachers was measured and the influence of school background, educational level and academic achievement on the students' perception of the teacher was seen.

## METHODOLOGY

### *Variables*

Two types of schools, namely, public and government; three educational levels middle, lower secondary and higher secondary and three levels of achievement—low, average and high, were taken as independent variables and the students'

perception of the teachers as influenced by independent variables was treated as a dependent variable.

### *Design and Conditions (Groups) of the Study*

A  $2 \times 3 \times 3$  factorial design with 18 conditions was used in this study with the variables mentioned above.

### *Sample*

Sampling was done at two stages. At the first stage of sampling, 81 and 69 students of Class VIII, 75 and 63 students of Class X and 60 and 69 students were taken, respectively, from Cambridge School (public school) and Government Higher Secondary School No. 3, Sarojini Nagar (Government School), from two randomly selected sections of each class in the schools mentioned except in the case of Class XII where there were only two sections.

At the second stage of sampling, on the basis of  $Q_1$  and  $Q_3$  values of the aggregate percentage of marks of the students in the previous examination, 60 students from each class of the two schools were selected for the study, making the tool sample as 360.

### *Tool Used*

On the basis of 16 perceived qualities of a successful teacher, obtained in Phase I of the study, a tool for the measurement of the students' perception of the teachers was developed methodically.

### *Procedure*

The data were collected in 18 sessions with the help of the tool developed by the investigator. The data thus collected were analysed with the help of analysis of variance, critical ratio, t-ratio and Duncan's range test.

## FINDINGS

The following are the findings of the study:

### *(a) Effects of Independent Variables on Dependent Variable*

- (i) There is a significant effect of the school background of the students on their perception of the teachers.
- (ii) There is a significant effect of educational level on the students' perception of the teachers.



- (iii) There is no significant effect of the academic achievement of the students on their perception of the teachers.

(b) *Interactional Effects of Independent Variables on Dependent Variable*

- (i) There is a significant interactional effect of the school background and educational level of the students on their perception of the teachers.
- (ii) There is no significant interactional effect of school background and academic achievement on the students' perception of the teachers.
- (iii) There is no significant interactional effect of educational level and academic achievement on the students' perception of the teachers.
- (iv) There is no significant interactional effect of school background, educational level and academic achievement on the students' perception of the teachers.

(c) *Group Comparisons*

- (i) There are significant differences among the mean perception scores of the students of the middle, lower secondary and higher secondary educational levels of both public and government schools.
- (ii) There are significant differences among the mean perception scores of the low, average and high academic achievers of both public and government schools.
- (iii) There are significant differences among the mean perception scores of the low and average academic achievers of the middle, lower and secondary levels; and of the higher secondary and lower secondary educational levels, but insignificant difference between the mean perception scores of the low academic achievers of the middle and higher secondary educational levels.

There are significant differences among the mean perception scores of the high academic achievers of the higher secondary and lower secondary levels; and of the middle and lower secondary educational levels. However, insignificant difference between the mean perception scores of the high academic achievers of the higher secondary and middle educational level is obtained.

- (iv) There are insignificant differences among the mean perception scores of the low, average and high academic achievers at each of the middle, lower secondary and higher secondary educational levels.



*Teacher Effectiveness Among Different Groups of Teachers in  
Relation with Personality Traits*

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AFTER Independence several committees and commissions have been set up to recommend methods of bringing about qualitative improvement in education. As a result, workers in the field of education have endeavored to develop better curriculum, textbooks and teaching aids. Considerable efforts have been made to devise better means of assessing students' achievement and techniques of teaching. But all these are of no use and development targets are bound to remain unachieved unless schools are staffed with effective teachers. Hence, for providing desirable education we require effective teachers who must be a powerful source of stimulation for their students. So the need of examining teacher effectiveness cannot be ruled out.

The present investigation is, thus, a modest attempt in this direction, in the light of the needs of the era.

OBJECTIVES

The objectives of the study are as follows:

1. To determine teacher effectiveness among different groups of teachers—Arts, Commerce and Science.
2. To determine personality traits among different groups of teachers.
3. To determine relationship between teacher effectiveness and personality traits among different groups of teachers.

HYPOTHESES

Null hypotheses for the study were formulated as under:

1. There is no significant difference between Arts and Commerce teachers regarding their teacher effectiveness.

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Thesis submitted to Sardar Patel University (1988).

2. There is no significant difference between Commerce and Science teachers regarding their teacher effectiveness.
3. There is no significant difference between Science and Arts teachers regarding their teacher effectiveness.
4. There is no significant difference between Arts and Commerce teachers regarding their personality traits.
5. There is no significant difference between Commerce and Science teachers regarding their personality traits.
6. There is no significant difference between Science and Arts teachers regarding their personality traits.
7. There is no significant relationship between teacher effectiveness and personality traits of Arts teachers.
8. There is no significant relationship between teacher effectiveness and personality traits of Commerce teachers.
9. There is no significant relationship between teacher effectiveness and personality traits of Science teachers.

#### DESIGN

The design of the study was ex-post-facto.

#### METHODS

The study adopted the Normative Survey and Correlation methods.

#### SAMPLE

Sixty Government Secondary schools of Nagaur district of Rajasthan which were situated in rural areas were randomly chosen for selecting teachers from them. The sample consisted of randomly selected 300 male secondary school teachers belonging to Arts, Commerce and Science streams. Each stream had 100 teachers.

#### TOOLS

The data were collected with the help of two tools. One, the teacher effectiveness scale was used to measure teacher effectiveness. It is a five-point Likert-type rating scale in Hindi which was developed and standardised by Kumar and Mutha

(1974). Second, the sixteen personality factor questionnaire was used to determine personality traits. It is a three-point inventory in English which was constructed and standardised by R.B. Cattell in 1949 and was adopted in Hindi in Indian conditions by S.D. Kapoor in 1970.

### STATISTICAL TECHNIQUES

Mean, Standard Deviation, Significance of Mean Difference and Coefficients of Correlation were used as statistical techniques to analyse the data.

### RESULTS

The results of the study are as follows:

1. Arts and Commerce teachers are equally effective.
2. Commerce and Science teachers are equally effective.
3. Science teachers are more effective than Arts teachers.
4. Arts and Commerce teachers are similar on personality traits: Reserved vs Outgoing (A), Sober vs Happy-go-lucky (F), Expedient vs Conscientious (G), Shy vs Venturesome (H), Trusting vs Suspicious (L), Practical vs Imaginative (M), Forthright vs Shrewd (N), Self-assured vs Apprehensive (O), Conservative vs Experimenting (Q<sub>1</sub>), Group-dependent vs Self-sufficient (Q<sub>2</sub>), Undisciplined Self-conflict vs Controlled (Q<sub>3</sub>) and Relaxed vs Tense (Q<sub>4</sub>).
5. Arts teachers are Assertive (E+) and Tender-minded (I\*), whereas Commerce teachers are Humble (E-) and Tough-minded (I-).
6. Commerce teachers are more intelligent (B\*) and Emotionally stable (C+), whereas Arts teachers are less intelligent (B-) and are effected by Feelings (C-).
7. Commerce and Science teachers are similar on personality traits: Reserved vs Outgoing (A), Tender-minded vs Tough-minded (I), Trusting vs Suspicious (L), Practical vs Imaginative (M), Forthright vs Shrewd (N), Self-assured vs Apprehensive (O), Undisciplined Self-conflict vs Controlled (Q<sub>3</sub>), and Relaxed vs Tense (Q<sub>4</sub>).
8. Commerce teachers are Emotionally Stable (C+), Conscientious (G+) and Venturesome (H+), whereas Science teachers are Affected by Feelings (C-) Expedient (G-) and Shy (H-).
9. Science teachers are more intelligent (B+), Assertive (E+), Happy-go-lucky (F+), Experimenting (Q<sub>1</sub>+) and Self-sufficient (Q<sub>2</sub>+), whereas Com-

- merce teachers are less Intelligent (B-), Humble (E-), Sober (F-), Conservative (Q<sub>1</sub>-) and Group-dependent (Q<sub>2</sub>-).
10. Science and Arts teachers are similar on personality traits: Affected by Feelings vs Emotionally Stable (C), Shy vs Venturesome (H), Trusting vs Suspicious (L), Forthright vs Shrewd (N), Undisciplined Self-conflict vs Controlled (Q<sub>3</sub>) and Relaxed vs Tense (Q<sub>4</sub>).
  11. Science teachers are Outgoing (A+), More Intelligent (B+), Assertive (E+), Happy-go-lucky (F+), Experimenting (Q<sub>1</sub>+) and Self-sufficient (Q<sub>2</sub>+), whereas Arts teachers are Reserved (A-), Less Intelligent (B-), Humble (E-), Sober (F-), Conservative (Q<sub>1</sub>-) and Group-dependent (Q<sub>2</sub>-).
  12. Arts teachers are conscientious (G+), Tender-minded (I+), Imaginative (M+) and Apprehensive (Q+), whereas Science teachers are Expedient (G-), Tough-minded (I-), Practical (M-) and Self-assured (Q-).
  13. Teacher effectiveness and personality traits (A, B, C, E, F, G, N, I, L, M, N, O, Q<sub>1</sub>, Q<sub>2</sub>, Q<sub>3</sub> and Q<sub>4</sub>) of Arts teachers have no relationship.
  14. Teacher effectiveness and personality traits (A, B, E, F, G, H, I, L, M, N, O, Q<sub>1</sub>, Q<sub>2</sub>, Q<sub>3</sub> and Q<sub>4</sub>) of Commerce teachers have no relationship.
  15. Teacher effectiveness and personality traits of Commerce teachers have negative relationship.
  16. Teacher effectiveness and personality traits (A, B, C, E, F, G, H, I, L, M, N, O, Q<sub>1</sub>, Q<sub>2</sub>, Q<sub>3</sub> and Q<sub>4</sub>) of Science teachers have no relationship.

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*Effective Teaching Strategies Used for Preparing Examinations as Perceived by the Students*

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THE present time is a period of competition. So we see today various coaching institutions being established. Some of them are more popular, because they are known for their effective teaching strategies. The present study was undertaken to identify such teaching strategies.

OBJECTIVES

The main objectives of the study were as follows:

1. Identification of strategies for teaching Zoology for CPMT competitive examinations.
2. Identification of strategies for teaching Botany for CPMT competitive examinations.
3. Identification of strategies for teaching Chemistry for CPMT and IIT competitive examinations.
4. Identification of strategies for teaching Physics for CPMT and IIT competitive examinations.
5. Identification of strategies for teaching Mathematics for IIT competitive examinations.

DESIGN OF THE STUDY

The methodology and procedure of the study were directly conditioned by the objectives.

The population for the purpose of this study was defined as the teachers and students teaching and reading, respectively, in coaching institutes of Allahabad, Agra, Lucknow, Meerut and Varanasi districts in Uttar Pradesh. Only IIT and CPMT

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coaching teachers and students were the subjects of the study. The teachers were selected on the basis of public opinion and pooled criteria (academic qualifications of the teachers, the pupils' achievement and their rating about the teachers). Thus, the purposive sampling technique was best suited.

The following tools were used in the present investigation to gather the perceived opinion of the students regarding the teaching strategies:

- (i) Participant uncontrolled observation
- (ii) Non-directive unstructured interview.

## DATA COLLECTION

The data were collected for the strategies used for teaching CPMT and IIT coaching classes. The teachers and the students of both the groups were interviewed separately. For gathering data for teaching strategies observation technique and interview profile were used. The data were collected at three stages. At the first stage observations were made on CPMT subjects, viz. Physics, Chemistry, Zoology and Botany and IIT subjects, viz. Physics, Chemistry, Mathematics. Secondly, the teachers of the observed classes were interviewed independently. Later on the students of both the groups were interviewed for collecting information regarding teaching activities.

## ANALYSIS OF DATA

The obtained data were analysed and interpreted in the following ways:

- The class observations were analysed into five teaching components, viz. Presentation, Practice, Diagnosis, Remediation and Evaluation for CPMT teachers and students, whereas IIT teaching was analysed into six components. Exercise was an additional component.
- Analysis and interpretation of such observations of teaching were analysed separately for each discipline.
- The obtained data for interviews of the students involved in coaching/and regular classes for the same teacher were analysed and interpreted.
- The data for interviews of the students involved in coaching classes were analysed and interpreted.
- Evolving teaching strategies for preparing students for CPMT and IIT examinations.

## DISCUSSION OF THE RESULTS

On the basis of the analysis and interpretation of the data, effective teaching strategies may be evolved. The results based on the observations and interviews of the students and teachers provide a basis for valid formulations.

## FINDINGS AND CONCLUSIONS

One of the main objectives of carrying out a scientific investigation is to draw conclusions. On the basis of the findings, effective teaching strategies were used at the coaching institutes.

A brief description of the teaching strategies used for CPMT examination, is given in the following paras:

### 1. Lecture-cum-Diagramatic Presentation

This strategy mainly focuses on the transfer of knowledge through an interesting experience. Some vague statements drawn on the board become clear by sketches and diagrams. The pupils also watch the techniques of drawing a particular diagram. Important points which the teacher wishes to stress are written on the blackboard and the students may raise questions concerning any point they do not understand. Note-taking itself is a reinforcement of learning. This strategy mostly is used in Zoology and Botany and rarely in Physics and Chemistry teaching.

### 2. Lecture-cum-Blackboard

Under this strategy, the emphasis is on acquisition of information, promotion of thought and changes in attitude. The lecture is supplemented by chalk-talk and short notes. The teacher includes recapitulation as an aid to the student. The use of the chalkboard not only adds life in the lectures, but also usually makes the teacher's ideas clearer. The teacher in his lecture, marks those things that he wishes to stress by writing them in capital letters, by underlying or by placing a large star in the margin. This strategy mostly is used in Physics and Chemistry and rarely in Zoology and Botany teaching.

### 3. Question-Answer Followed by Testing

This strategy aims at achieving the cognitive objective and bringing knowledge to the conscious level. The teacher asks a few questions and presents them in conductive manner during teaching. The teacher asks new questions by linking them with the learners' responses. The teacher is able to recognise the intention of



the learners and provides motivation accordingly. He has to identify three phases of the learning process: observation, experience and testing. It is important that testing is treated as an inseparable part of the teaching-learning process and evaluation data used as a diagnostic device. This strategy is used in teaching all the four subjects, viz. Zoology, Botany, Chemistry and Physics.

#### 4. Review-cum-Discussion

Reconstruction of learning in order to deepen the understanding of relationships is the main focus of this strategy. This opportunity is particularly valuable for those who learn more slowly, precisely because they do not tie things together well. Choice of approach, opportunity to practice a needed skill or review an area of weakness, and possibility of selecting an alternate assignment encourage self-awareness and direction as well as creative solution. The students have to study on their own and, therefore, they get motivated for self-learning.

The objectives of this strategy of teaching are clarification on matters of facts and development of lines of thought and interest that have been stimulated in the course of the lecture. In this discussion, points or questions are raised either from the lecture floor or review level. The teacher uses this form of discussion after periods of lecturing, but it can easily fall flat if the lecture is not sufficiently stimulating. This strategy involves some feedback and is used in all the disciplines of CPMT.

We may now describe in brief the teaching strategies used for IIT examination.

#### 1. Lecture-cum-Blackboard

This strategy focuses on presentation developed by the teacher in a manner which best suits the situation and the level of the students addressed. The teacher pays special attention to the opening and closure of the lecture: the opening, in order to set the tone of the lecture and capture the students' attention, and the closure, to summarise and emphasise the major points. The teacher allows for questions occasionally and calls for further questions and comments on the conclusion of the lecture.

The blackboard remains the most commonly used visual aid in the classroom. The use of the blackboard is highly essential particularly for the teaching of science, mathematics and, to a smaller extent, for the teaching of other subjects. The teacher vitalises teaching through good, clear, well-proportioned illustrations developed in the presence of pupils making good use of colour chalk to emphasise or differentiate specific points, aspects or details. This strategy is used for teaching all the subjects for the IIT examination.

## 2. Question-Answer Followed by Testing

Aimed at achieving the cognitive objective and bringing knowledge to the conscious level, this strategy is used by the teacher to formulate some convergent questions that are appropriate for the subject field. The teacher puts up questions in conductive manner to diagnose, evaluate and obtain the attention of the wandering minds of the students. Before making a realistic plan for instructional activities, the teacher wants to know the level of the students' achievement. This information is obtained through the process of testing. Effective teaching requires feedback that is provided by testing. This strategy is used for teaching all the subjects.

## 3. Review-cum-Discussion

This strategy is used as a means for linking the day's lesson with the preceding lessons. End-of-unit and end-of-term are useful. Besides, end-of-unit and end-of-term reviews tend to become preparations for examinations. After reviewing the topic, the students ask some questions. This leads to a discussion among the students and between the teacher and the students.

## 4. Assignment-cum-Clarification

This strategy aims at assimilation of the content. The teacher helps the students find a reason for out-of-class work by the nature of his assignments and through discussion that helps them understand the nature and purpose of those assignments. The teacher clarifies the misunderstandings and solves the difficulties of the students. This strategy is used in all the subjects of IIT.

In conclusion, the principal impact of these strategies on the teacher is to broaden his perspective about the subject teaching. It helps the teacher become a facilitator. The impact on the students is to give them freedom to learn.

## IMPLICATIONS

Any research effort goes waste if it does not contribute to the existing knowledge or help the discipline in which it has been made. It must have certain implications and should facilitate the growth of the discipline. The implications of the study are as below:

- Teaching is the most important factor in the whole formal system of education. The findings of the present study will provide new information for the coaching institutes. It may be useful to the polytechnics and other medical

- and engineering coaching institutes involved in preparing students for competitive types of entrance examinations.
- These evolved teaching strategies may be employed in such types of coaching institutes which provide objective-based teaching for jobs in different professions.
- These teaching strategies may be helpful to those research scholars who are aspiring for junior research fellowships.
- These strategies may also be helpful to those employed persons who are aspiring to get through promotion tests.
- These evolved teaching strategies may be used in our classroom situations for improving the results of the students.
- The present system of education focuses on the objectives to be achieved by the students rather than the content field. From this angle of interpretation, these evolved strategies are not based on the objectives related to the students' growth but also they are capable of bringing about better improvement in respect of learning abilities.
- Thus viewed, the evolved teaching strategies accelerate the growth of the students in competitive capacity and provide some basis for sustained growth/development.

#### SUGGESTIONS FOR FURTHER POSSIBILITIES

The teaching strategies cannot ever remain final even if evolved with utmost research care. In order to meet the newer demands on the instructional process, more and more effective and feasible strategies may be evolved through continuous experimentation and research. On the basis of the findings of the study and the experience of the researcher, some such studies may be designed and conducted:

- It may be worthwhile to identify the teaching styles of successful teachers of coaching classes with reference to IAS, PCS and IPS.
- Studies can be undertaken for degree college/university teachers. They are teaching for the essay-type of examinations. Most of them have developed their own styles of teaching, based on their experiences and common sense.
- A master model of teaching may be developed.
- A comparative research can be designed to study the effectiveness of coaching strategies as compared to the traditional classroom strategies in teaching science and mathematics at the intermediate level.
- Research studies can be conducted for the development of an observational instrument for the students' growth for science and mathematics teaching at the intermediate level.

- A follow-up programme may be designed to ascertain the effectiveness of coaching institutes.
- Teaching strategies can be identified for medical and engineering classes.



### *Personality Traits of Educated Blind and Sighted Youth*

S.R. MITTAL

IN popular belief "personality" denotes how a person appears to others. The present scientific concept of personality encompasses the intellectual, emotional, motivational and behavioural aspects of the individual. It is a product of inherited qualities and environmental influences. Allport has given a scientifically acceptable definition as: "Personality is the dynamic organisation within the individual, of those psycho-physical systems that determine his unique adjustments to his environment."

Blindness limits the range and variety of experiences, physical mobility and interaction of the individual with his environment. It is a major factor that does not allow majority of the people to view the personality make-up of the blind in an objective manner. It appears that negative attitudes of the society, on the one hand, and various limitations imposed by blindness, on the other, as well as limited educational opportunities afforded to them may cause differences in the make-up of the personality of the blind vis-a-vis the sighted individuals.

The review of researches showed very clearly that the studies related to the personality traits of the blind and the sighted are very limited in number. Particularly in India the researches conducted on personality traits/personality pattern are very few and these are limited in scope and have been conducted on small samples. The review also revealed that only general tools standardised on the sighted population, have been used to study the blind.

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Thesis submitted to Garhwal University (1988).

Therefore, the present study was undertaken on a large sample, covering much wider field and using a unique adapted scale for the blind parallel to the personality test of the sighted.

### THE PROBLEM

Does or does not blindness influence personality development? If it does, then in what manner and to what extent? This issue was sought to be studied through comparison between certain personality traits of the educated blind and sighted youth.

### OBJECTIVES

The present study was conducted with the following objectives:

1. To make a comparative study of the blind and sighted youth matched for age, education, income of parents/guardian, on all the 16 personality factors postulated by Cattell.
2. To devise a family environment interview schedule.
3. To study family environment as perceived by the blind and to make a comparison with the family environment as perceived by the sighted.
4. To identify correlations, if any, between personality and perceived family environment.
5. To recommend appropriate educational and rehabilitation services for the VH comparable with identified personality differences.
6. To suggest parent and community education methods to overcome identified deviations, if any.

### ASSUMPTIONS

The study had the following assumptions:

1. The 16 PF test of Cattell is equally valid for the study of the personality of the blind and the sighted.
2. Differences, if any, are identifiable.
3. Identification of differences, if any, would assist in restructuring programmes of education and rehabilitation of VH.
4. Identifying differences, if any, would facilitate mutual understanding between the blind and the sighted, and thus promote socio-psychological integration.

## HYPOTHESES

The following hypotheses formed the basis of the study:

1. There is no significant difference in the personality traits of the educated blind and sighted youth.
2. There is no significant difference in personality traits between VH males and females.
3. There is no significant difference with regard to the family environment of both the groups as perceived by the subjects.
4. Education (years of schooling) and perceived family environment have no significant influence on personality traits.

## SAMPLE

This study was conducted on 200 educated youth from Uttar Pradesh and Delhi only. Of these, 100 were visually handicapped and the other 100 sighted. Fifty of each group were males and the other 50 females. The age-range was 18 to 35 years. The educational qualifications of both the groups varied from matriculation to post-graduation and some professional training. The purposive-cum-convenience sampling technique was used for selecting the sample. The subjects of both groups were matched on the basis of their education, age and income of the parents.

## METHODS, TOOLS AND TECHNIQUES

In this study, the descriptive research method was used to study the personality traits of the blind and the sighted youth.

Two types of tools were employed to make the study more comprehensive and scientific:

- (i) Standardised tools
- (ii) Tools developed by the investigator

The Hindi adaptation of Cattell's 16 PF test was used to study the personality traits of the sighted youth. It is standardised by Dr. S.D. Kapoor.

The investigator adapted the Hindi version of the 16 PF test for the blind youth with the purpose of studying the personality traits of the blind in Braille form.

The investigator also developed Personal Data Sheet to collect personal information regarding the youth under study. He also developed and used Family Environment Interview Schedule to study the family environment of the blind and sighted youth.

In this study Testing, Interview and Statistical techniques were used. Testing was employed to study the personality traits of the sighted and blind youth and the interview technique was used to collect information regarding family environment with the help of the structured interview schedule.

#### LIMITATIONS OF THE STUDY

The present study, however, had the following limitations:

1. The study was confined to 100 educated blind and 100 sighted youth drawn from Delhi and Uttar Pradesh only, thus limiting its cross-cultural validity.
2. Since the questionnaire method was employed, the validity of the responses depended on the state of the mind of the subjects at that time.
3. In studying the family environment, only the perceptions of the subjects were reflected. The parents were not interviewed.
4. The blind subjects belonged to residential schools. Therefore, personality differences, if any, between residential school blind population and those in integrated setting were not identified.
5. Only the educated blind and sighted subjects were studied. No blind or sighted individuals over the age of 35 years were studied. Thus, age-related differences are not fully reflected.
6. In matching for education, only years of schooling were taken into account.
7. In matching for socio-economic status, only the income of the parents/guardians of the subjects was considered.

#### ANALYSIS OF DATA

The results were analysed statistically, using 't' test and product moment coefficient of correlation. The 't' test was applied to study the differences, and correlation was computed to study the relationship between age, education, income of parents/guardians separately, with each of the 16 personality factors. The subjects' perception of their family environment was also studied, using the structured interview schedule. Its relationship with each of the 16 personality factors was also studied separately for the sighted and visually handicapped subjects. Difference in score between male and female was also studied.

Table 1 presents the Mean, SD and t-values of the blind and sighted subjects on the 16 personality factors.

TABLE 1					
PF	Group	Mean	SD	t-value	Level of Statistical Significance of the Difference
A	VHT ST	4.89	1.56	1.31	
		4.59	1.68		
B	VHT ST	2.57	1.75	6.53	.001
		4.34	2.07		
C	VHT ST	3.74	1.91	1.98	.05
		4.27	1.88		
E	VHT ST	5.00	1.73	1.17	
		4.71	1.77		
F	VIIT ST	2.96	1.36	.26	
		3.01	1.41		
G	VIIT ST	6.17	1.64	.90	
		6.39	1.82		
H	VHT ST	5.63	1.25	.09	
		5.65	1.67		
I	VHT ST	5.48	2.13	1.11	
		5.14	2.19		
L	VHT ST	6.98	1.39	4.09	.01
		6.03	1.86		
M	VHT ST	5.16	1.73	.56	
		5.30	1.79		
N	VHT ST	5.70	1.64	3.28	.01
		6.55	2.01		
O	VHT ST	6.20	1.95	3.17	.01
		5.31	2.02		
Q1	VHT ST	6.76	1.71	2.76	.01
		6.07	1.82		
Q2	VHT ST	5.79	1.57	.63	
		5.93	1.56		
Q3	VHT ST	5.53	1.59	2.37	.05
		6.02	1.32		
Q4	VHT ST	5.17	1.62	2.39	.05
		4.62	1.63		

Table 2 shows the mean scores of the blind male and female subjects as well as the level of statistical significance of these six personality and three second order factors on which differences were found to be statistically significant.



TABLE 2				
PF	Mean Score		t-value	Level of Statistical Significance of the Difference
	VH Female	VII Male		
A	4.46	5.32	2.85	.01
B	2.15	2.83	2.143	.05
H	5.36	5.9	2.14	.05
I	4.22	6.74	7.26	.01
Q1	7.44	6.08	4.285	.01
Q4	5.5	4.84	3.12	.01
Second Order				
QII	6.59	5.82	2.53	.05
QIII	6.32	3.32	11.67	.01
QIV	5.97	5.08	4.097	.01

Table 3 represents the mean scores, SD and t-values of the blind and sighted subjects on the second order factors.

TABLE 3					
Factor	Group	Mean	SD	t-value	Level of Statistical Significance of the Difference
QI	VHT	4.34	1.13	.64	
	ST	4.23	1.28		
QII	VHT	6.205	1.57	4.19	.01
	ST	5.26	1.62		
QIII	VHT	4.82	1.98	.18	
	ST	4.87	1.91		
QIV	VHT	5.52	1.17	2.47	.05
	ST	5.23	1.33		

Table 4 presents the mean scores of the blind male and female subjects as well as the level of statistical significance on those second order factors on which differences were found to be statistically significant.

TABLE 4

Aspect	Mean Score		t-value	Level of Statistical Significance
	Blind	Sighted		
a.	3.23	3.92	- 11.59	.001
b.	3.77	5.82	- 20.99	.001
c.	2.44	3.55	- 12.55	.001
d.	1.20	1.94	- 15.83	.001
e.	1.16	1.97	- 19.93	.001
f.	1.32	1.37	- 00.74	Not significant
Perceived Total Family Environment	13.12	18.57	- 23.23	.001

It is generally believed that demographic variables like age and education also have profound influence on the personality development of an individual. As such the investigator studied the correlations between age, education (years of schooling) and perceived family environment of the subjects of the target groups with the Cattell's 16 Personality Factors. In the case of the visually handicapped subjects, age was found to be positively correlated with PF B. Further, it was found to be negatively correlated with PF O and PF Q4.

In the case of the sighted subjects, age was found to be negatively correlated with PF E.

Education (years of schooling) was found to be positively correlated with PF B and Q3 in the case of the visually handicapped subjects. Further, education was found to be negatively correlated with PF Q4 in the case of the blind subjects.

In the case of the sighted subjects, education was negatively correlated with PF L.

Perceived family environment was found to be negatively correlated with PF A in the case of the visually handicapped. In the case of the sighted subjects, perceived family environment was found to be positively correlated with PF B, and G. It was found to be negatively correlated with PF E, L and Q4 in the case of the sighted subjects.

#### SUMMARY OF THE FINDINGS

The findings of the present study may be summed up as follows:

1. The differences observed are quantitative and not qualitative. The scores of the sighted and visually handicapped subjects were not found to be on either extreme of the scale.

2. Statistically significant differences were found in some of the personality traits of the blind and sighted youth. The major differences were found on account of higher level of anxiety among the blind subjects.
3. Qualitative differences were not found in the personality traits of the visually handicapped females and males; only some quantitative differences were observed. It appears to be due to different treatment meted out to the females in our society.
4. The perception of family environment by the blind was found to be highly negative. It was found to be highly positive among the sighted subjects. As the parents of the blind subjects could not be interviewed, the views/perceptions of the blind about family environment are only one side of the picture. Their perception might have been influenced by social isolation.
5. Age, education (years of schooling) and perceived family environment were found to have influenced the personality development of the blind as well as sighted subjects.

#### EDUCATIONAL IMPLICATIONS

Need-based parent education programmes should be organised all over the country to assist better assimilation of the blind in their families. This will not only promote social integration of the blind but also lay strong foundation for their sound personality development.

Educational facilities for the visually handicapped children should be improved and expanded to minimise the effects of loss of sight on educational achievement. This will help in improving the self-confidence, general intelligence and reducing frustration of the blind individuals.

Job-oriented training facilities for the blind should be improved and substantially expanded. The trained blind should be provided with suitable jobs so that they may become economically and socially secure. This will help in reducing the undesirable level of anxiety in them. Suitable legislative measures, as in the case of the Scheduled Castes and Scheduled Tribes, may be taken to ensure the availability of suitable jobs to the blind.

The blind may be provided with necessary gadgets/equipments for their education/vocation at highly subsidised rates for their better rehabilitation.



## *Construction and Standardisation of an Art Judgement Test*

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ART is one of the elements which tends to make all the activities of life perfect and purposeful. Man has always longed for enjoying truth, well-being and beauty. Artistic vision is nothing but realising and appreciating this inherent beauty in an art piece. Hence, one is not in a position to evaluate and enjoy the beauty of an art piece unless he has specific aesthetic values, art appreciation power or sense of beauty. Of course the sense of beauty may differ from person to person; but the question naturally arises is: whether this artistic value sense can be measured by a paper-pencil test. If it can be, what must be its criteria?

Research is one of the alternatives as an answer to this and such other questions.

### OBJECTIVES

The present study had the following objectives:

1. To construct a test to assess the art judgement ability of students of Grades VIII to XII in secondary and higher secondary schools.
2. To standardise the test on the population of schools chosen by random method.
3. To test whether there is any significant sex difference in students so far as art judgement ability is concerned.
4. To check whether age difference has any considerable effect on art judgement ability.
5. To investigate whether there is any relation between art judgement ability and art environment.
6. To test whether there is any significant difference in art judgement ability among art and non-art students.

With the help of variables such as age, grade, sex, art environment and training in art, various null hypotheses were framed.

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## IMPORTANCE OF THE STUDY

A good number of research works relating to textbook, methods and techniques of teaching, and measurement and evaluation have been conducted concerning various subjects taught at school level in our country. But research work in the field of Art and Art Education at school level has not been found to our requirements and satisfaction.

In such a condition the present study is more important not only because of its originality but its multifarious utility today.

1. It helps art teachers to find out students having art aptitude.
2. The results of this test can be considered as a supplement to the results of the other psychological tests.
3. It can be a useful tool to measure the art judgement ability of students for guidance or selection.
4. The present study shall provide a fair ground for further related studies.

## LIMITATIONS OF THE STUDY

The following were the limitations of the study:

1. This study was limited to the students studying in secondary and higher secondary schools of Gujarat State during the academic year 1987-88.
2. Only Gujarati-medium schools were included in the study.
3. No coloured pictures were used in the test.

## TEST CONSTRUCTION

Test items were constructed, following the procedure as given below:

1. *Elements and Principles of Art (Design)* : For this purpose books which are considered authority in the field of art were referred to and thereafter a list of elements and principles as shown below were prepared.

The elements are the materials from which all designs (pictures) are built. These elements are:

- Line
- Direction
- Shape (Form)
- Size (Proportion)
- Texture
- Value.(Light-shade)
- Colour

These elements are related or organized according to the principles. These principles are:

- Similarity
- Balance
- Unity
- Harmony
- Contrast
- Gradation
- Repetition

2. *Drawing of Picture Pairs* : A picture can be drawn by a proper planning and selection of more than one of the above-mentioned principles and not by selecting any one of them singly.

Consequently, the researcher gave more weightage to the main principle and prepared 110 picture-pairs in the beginning. After discussion with art experts, 100 pairs were found to be fit for the test. These 100 picture-pairs were drawn on art paper for the offset printing process.

In each of the picture-pairs one picture was completely faithful to the principle chosen, while the other one was slightly disturbed. Each pair was given a number, with the symbol 'A' and 'B' to individual pictures of the pairs. Placement of the pictures was done in a random way.

### *Prior to Pilot Testing*

With a view to deciding the validity of the answer-key and also to coin special words for the points on which the pictures of the pair were differing, the researcher interviewed 25 Art Masters and Drawing Teachers. As a result of this interview, two picture-pairs out of 100 were reconstructed.

Finally, a test-booklet containing 100 picture-pairs was ready for pilot testing.

### *Pilot Testing*

Pilot testing was done on 561 students, of which 286 were boys and 275 girls. As a result of item analysis, 50 pairs of pictures were selected. It was ensured that all the principles on the basis of which the test was constructed did have full representation in the final test.

### *Final Test*

As a result of pilot testing, a group of 50 pairs was ready for final test. Because of the rejection and on account of the changed order of the items, a new test and its answer-sheet were prepared. No time-limit was fixed for the test. However, the test was of the type that could be completed, in general, within 30 to 40 minutes.

### SELECTION OF THE SAMPLE AND ADMINISTRATION OF THE FINAL TEST

A random sampling technique was used in the present study. According to the geographical situation of Gujarat, nine cities were selected. In each of them two or three schools (Boys and Girls) were randomly selected. Classes were also selected randomly.

The final test was administrated to 4253 students from Grades VIII to XII in the academic year 1987-88.

### ANALYSIS OF THE DATA

Analysis of the data was done according to variables such as sex, age, grade, art experience and art environment. Means and SD were calculated for each group and significance of difference between two means was checked with the help of the t-test.

### RELIABILITY AND VALIDITY

1. Reliability of the test was checked by the split-half method, test re-test method and rational equivalence method, with reliability coefficient of all the three methods being 0.69, 0.75 and 0.66, respectively.
2. Validity of the test was also checked. The test was given to the art students of an art college. Their scores were framed into frequency distribution. The distribution of the art students and those of the students of Grades VIII to XII were compared. This comparison was shown by frequency curves (predictive validity).

Items of the test were constructed on the basis of the graphic art principles. Prior to pilot testing, the items were also tested and discussed with 25 art masters (construct validity).

### NORMS

The norms, prepared in percentile and stanine, were presented with two sub-groups:

1. Art students and non-art students
2. According to sex.

## FINDINGS

1. The art judgement scores of the boys were higher than those of the girls on the art judgement test. Thus the art judgement ability of the boys was superior to that of the girls.
2. The students of higher grade scored more than the students of lower grade.
3. So far as age was concerned, art judgement power increased till the age of 15-16 years. Thus the ability of art judgement crystallized by the age of 15-16 years. Art judgement ability, being an aptitude, matured by the age 15-16 years and did not increase thereafter as in the case of other aptitudes.
4. Art judgement ability may be increased by the guidance of good instructors.
5. Neither family's art activity nor art environment had any effect on the art judgement ability of the students.

## IMPLICATIONS

1. Teaching methods for art appreciation should be made more effective. Girls should particularly be given more attention and more art experiences. Awareness of art should be created among young students.
2. While teaching art appreciation, representational and non-representational art (abstract) should be referred to when art expression is not understood.
3. Even if students cannot draw or paint up to standard, at least care should be taken that they are in a position to enjoy and appreciate art.



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## Research Notes

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### *Graduate Studies in Philosophy of Education: History of Philosophy of Education*

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THE following principles and specific suggestions regarding the nature of graduate studies in philosophy of education presume a sound academic status of philosophy of education and its worthiness for being considered as a graduate level area of concentration. In developing a sequence of graduate courses in philosophy of education, various kinds of patterns ought to be considered in order to provide a suitable scope and meaningful organization of the courses. The following remarks are intended to characterize briefly each of several patterns of courses in a graduate programme in philosophy of education and to elaborate in some detail the meaning of one of these patterns, "history of philosophy of education."

The term "pattern" is intended to designate a general manner of proceeding in the development of a sequence of courses in philosophy of education, which manner is specified by an emphasis upon some legitimate dimension of the framework of the subject matter. The alternative or possible patterns may be distinguished most generally as primary and secondary; the former refers to the more fundamental patterns, which serve as bases, in a sense, for the development of the latter. Primary patterns include history of philosophy of education, philo-

sophical movements and education, and systematic philosophy and education; secondary patterns center upon "special problems", "individuals", and "texts".

These primary and secondary patterns are considered in light of a perspective which sees "philosophy of education" as the application of philosophical thinking and principles to education, or philosophical inquiry as process and product applied to educational matters.

The first primary pattern, termed "history of philosophy of education," features investigations into the philosophies of education<sup>1</sup> promulgated by selected individuals who represent the "great thinkers" in the history of ideas. This kind of study is directed toward the thought of certain individuals in a chronological order, generally with some attention to the milieu in which the person lived. A course exemplifying this pattern might be entitled Ancient Philosophy and Education.

"Philosophical movements and education" refers to a series of courses devoted to inquiry into the philosophical principles of individuals who represent distinct modes of philosophy, and applying the processes and products of such to educational matters. Each particular mode of philosophy has representatives whose principles vary significantly, yet with sufficient commonality to be categorized (with some meaning and legitimacy) within the same philosophical movement. For example, "pragmatism" signifies differing philosophies which possess similarities of a nature and extent which enable them to be called by the same name. A course in philosophy of education which could be developed in concert with this pattern might be named Pragmatism and Education.

Thirdly, the primary pattern designated "systematic philosophy and education" suggests a network of courses devoted to the investigation of particular branches of philosophy and implications for education. The term "branches" here refers to typical divisions of philosophy as metaphysics, epistemology, ethics, philosophical anthropology, etc. Therefore, a course in philosophy of education which represents this pattern might be called Metaphysics and Education.

The category of patterns considered "secondary" includes, first of all, what might be termed "special problems". This pattern is associated in a general way with "systematic philosophy and education" and is apparently distinguished from it only when the philosophical problems employed to structure the courses are narrowed to the point where they are more specialized than those problems underlying courses in the systematic approach. The "special problems" are investigated philosophically, and the process and product of that inquiry is applied in suitable manners to the theory and practice of education. An example of this kind of course is one which would fit the title *Philosophies of Evolution and Education*.

The second so-called secondary pattern is labelled "individual philosophers". This pattern, apparently more closely associated with the first and second primary patterns than with the third (and more similar to the first than to the second) is

reflected by a series of courses focusing upon the philosophical-educational principles of one individual and the relationship among those principles. (As in all the other kinds of courses described here, it is also possible that a particular philosopher who has not written on education might become the subject of this kind of course if his thought has had or does hold significant ramifications for education.) A course entitled *St. Thomas Aquinas and Philosophy of Education* exemplifies this pattern.

Finally, another secondary pattern—referred to as that of “philosophical texts”—is an offshoot of the “individual philosophers” pattern, and is, therefore, quite directly related to the historical pattern and potentially to the systematic pattern (depending upon whether the text is addressed to matters within a single branch of philosophy). Attention is devoted to an analysis of the philosophical text(s) and implications for education. When more than one text is introduced, both or all of them are usually from the same source, although that does not seem necessary. An example of this pattern could be found in a course designated simply *Philosophy of Education in the Republic of Plato*.

All the potential courses (in their ideal form) within these six patterns seem to bear three common characteristics: (1) they entail the study of principles of individual persons (or, at least one person); (2) they include attention to the nature and resolution of pertinent current problems; and (3) they promote an awareness of the distinction between interpretation or exposition of principles (devoted to attempting to understand and explain them), and evaluation of principles (concerning an effort to judge the truth or value of them) as a means to the development of the student's own philosophy of education.

Most of the remainder of this essay focuses upon the meaning of “history of philosophy of education”, first of all, describing specific courses to comprise a graduate programme in philosophy of education in accord with this pattern; secondly, formulating responses to two specific objections to the development of such a programme; thirdly, clarifying some specific details of the structure of a course in this realm; and finally, suggesting reasons which seem to recommend this particular pattern as an essential part, if not the basis, of a graduate programme in philosophy of education.

The following four (three-semester-hour) courses could constitute the basis for a graduate programme in the history of philosophy of education in Western civilization.

#### *Ancient Philosophy and Education*

Consideration of major philosophical and educational themes of Socrates, Plato, and Aristotle. Brief attention to groups such as the Sophists, the Stoics, and the Epicureans; and to individuals such as Quintilian and Cicero. Focus upon the interrelationships between philosophy and education. Emphasis upon implications for current problems, and upon the development of the Student's own philosophy of education.

#### *Medieval Philosophy and Education*

Consideration of major philosophical and educational themes of prominent Christian, Jewish,

and Islamic thinkers from St. Augustine to William of Ockham, including extensive attention to St. Augustine and St. Thomas Aquinas as well as briefer attention to individuals chosen from among the following: Plotinus, St. Anselm, Abelard, Alfarabi, Algazali, Maimonides, St. Bonaventure, Duns Scotus, and Ockham. Special attention to questions regarding the relationship between religious faith and philosophical reasoning, and the rise and decline of the universities. Focus upon the interrelationships between philosophy and education. Emphasis upon implications for current problems, and upon the development of the student's own philosophy of education.

#### *Modern Philosophy and Education*

Consideration of major philosophical and educational themes of outstanding thinkers from Descartes to the end of the nineteenth century: to include the study of several individuals chosen from among Descartes, Leibniz, Spinoza, Rousseau, Locke, Hume, Kant, Hegel, Marx, Kierkegaard and Nietzsche. Particular attention to inquiry concerning the clash between the emerging natural sciences and classical metaphysics, the rise of the historical sense, and the philosophy of religion. Focus upon the interrelationships between philosophy and education. Emphasis upon implications for current problems, and upon the development of the student's own philosophy of education.

#### *Contemporary Philosophy and Education*

Consideration of major philosophical and educational themes of significant European and American thinkers of the twentieth century, such as Bergson, Russell, Ayer, Wittgenstein, Husserl, Heidegger, Jaspers, Sartre, Buber, Marcel, Dewey, and Maritain. Special attention to the diversity of meanings attributed to "philosophy", and to the variety of modes of philosophical discourse. Focus upon the interrelationships between philosophy and education. Emphasis upon implications for current problems, and upon the development of the student's own philosophy of education.

While these four courses could be condensed into two—combining the ancient with the medieval, and the modern with the contemporary—such an amalgamation would alter drastically the manner in which each course potentially could represent the scope ascribed to it. The point is that a three-semester-hour course in Ancient Philosophy and Education can hardly be more than a sketchy survey; the pertinent conclusion one must draw regarding a three-semester-hour course in Ancient and Medieval Philosophy and Education is sufficiently clear. Furthermore, the development of two rather than four courses in this sequence would lessen the variety of courses, which seems to be an item of some significance in any graduate programme.

Perhaps the following objection to a sequence such as the above in the history of philosophy of education might be raised: not all—in fact, relatively few—of the individuals mentioned in the course descriptions were philosophers of education, in the sense that they investigated philosophical problems and systematically applied that thinking and resulting conclusions to educational matters. Although the objection as stated embodies a fact, it is not an objection if one presumes that inquiry in the history of philosophy of education can be directed to works exclusively or predominantly philosophical and to those devoted exclusively or predominantly to educational theory and/or practice. In regard to the first situation (for example, using Aristotle's *Metaphysics*), one can investigate the philosophical principles and raise the question of logical implications for education—whether sought primarily in the work of another individual, in a group report, in the practical conduct of education, or in none of these. Concerning the second circumstance (for example, using Newman's *The Idea of a University*), one can investigate the educational theory and seek possible philosophical foundations of

that theory—whether primarily in the work of another individual, or in a group report, or in neither of these. (Care has to be exercised in these instances to avoid blurring the distinction between the historical fact of a bond between philosophy and education, and a logical relationship between them.)

Another area of criticism which deserves serious attention is found among those who object to a tendency to identify philosophy of education with its history, and, therefore, studying philosophy of education simply by perusing its historical development. It does seem clear enough that the identification just suggested is invalid, for no awareness of the history of philosophy of education, in itself, can prescribe what philosophy of education ought to be today or tomorrow despite the intimate bond between the past, the present, and the future. Although current efforts in philosophy of education are linked to the past, there is a need for confronting our own times and the difficulties and challenges embodied therein. Of course, it is clear that philosophy of education is not being identified with its history here since the history of philosophy of education is to comprise only one pattern of a graduate programme in philosophy of education. Nevertheless, this raises the question of the role of the past in the study of philosophy of education. After observing the problem in a bit more detail, theoretical and practical suggestions toward a resolution will be offered.

Crucial to an explanation of the nature of studies in philosophy of education is explicit attention to the relationship between investigating philosophical processes and conclusions with implications for education on a historical basis, on one hand, and becoming aware of and cultivating the development of one's own philosophical principles and relating them to educational matters, on the other. Some might find serious opposition between these two factors. For example, one objection to undertaking the first element might be that it wastes the time of teachers and students with a dead, antiquarian past. Another objection might lie in the assertion that the inquiry into the history of philosophy of education detracts from, or even negates, efforts to promote students to "do" philosophy of education, that is, to think philosophically about matters educational.

From the perspective operative here, there is a decided harmony between concern for the existential present and for the historically remote. In fact, one might be able to argue convincingly that cultivating one's own philosophy of education in the most efficient and sound manner *requires* some concern for the history of philosophy of education. Philosophy of education in history can be "treated" as if it were dead and antiquated, which would justify the first objection (concerning the waste of time by teachers and students). However, that would be an abuse rather than a use of history. The past, in the form of one's heritage or tradition, is not a deadening burden if properly perceived, but a dynamic reality challenging present thinkers to even more noble efforts.<sup>2</sup>

In regard to the second objection (concerning the obfuscation of "doing" philosophy of education), it appears that attention to one's heritage in philosophy of education in the appropriate manner does not discourage, but promotes and stimulates, reflection. Thinking with the great thinkers of the past—by reading, discussing, and evaluating their principles—raises the question of the relationship between what "they" think and what "I" (teacher or student) think. This matter needs to be addressed logically and pedagogically. Logically, it appears that, in order to choose a dimension of the past to confront intellectually, or, in an intellectual confrontation, one must exercise his or her own point of view.<sup>3</sup> Furthermore, one's own perspective is necessarily functioning in the comprehension and evaluation of the particular principles in philosophy of education which are selected for study. On the other hand, it appears that real assimilation and appreciation of the principles of great thinkers in the history of philosophy of education, by thorough familiarity with their first principles, the utilization of their method(s), and the comprehension of their conclusions, is fundamental to one's intellectual development—at least when one's effort is directed toward their ideas, not as works of art, but as potential truths. Therefore, it seems that one's own philosophical stance (and, hopefully, the awareness of that posture) is required in intelligently opening oneself to the past, and that the process of investigating thoroughly the principles developed in the history of philosophy of education serves to promote the cultivation of one's own thinking in these matters. As a result, these two factors may be considered correlatives, in a sense.

The relationship between what "they" think and what "I" think in its pedagogical dimension raises the question of procedures to be adopted in the classroom to effect the desired results. Among possible suggestions, the following seem pertinent: (1) the student ought to reflect directly upon his own position in matters pertaining to philosophy of education; (2) he ought to develop his own philosophy of education throughout the duration of the course; (3) he ought to formulate carefully an "essay toward the clarification of his own philosophy of education" near the conclusion of the course, recognizing this statement as a significant point in a continuing process of such reflection; and (4) he ought to read, discuss, and evaluate the writings of outstanding philosophers, educators, and philosophers of education. The study of noteworthy individuals in the history of philosophy of education is undertaken in order to understand and appreciate not only them and their own times, but also, and perhaps more importantly, oneself and one's own times and the future. For the teacher this means not only a thorough awareness of, and serious attention to, principles in the philosophy of education, but also an awareness of, and attention to, the students themselves.

While the above comments pertain to the general nature of a graduate course in the history of philosophy of education, a more detailed analysis of such a course hopefully will serve to clarify further the explanations and examples above. Among the legitimate purposes of a course in the history of philosophy of education in a graduate programme are the following:

1. to promote an understanding of the meaning of "philosophy of education";
2. to effect a comprehension of and appreciation for the primary principles, methods, and conclusions of selected major philosophers, and some implications for the field of education;
3. to promote a comparison and evaluation of these various modes of thinking;
4. to enhance the possibility of a habitually philosophical approach to educational matters;
5. to bring about the awareness and development of the student's own philosophy of education;
6. to provide further foundation and motivation for doing the work of a teacher in a manner conducive to the perpetuation, cultivation, and development of genuine wisdom.

The remarks to follow, concerning the nature of a course in which an attempt is made to implement these purposes, rest upon at least four assertions:<sup>4</sup>

1. awareness of the past, in general, and the thinking of past others, in particular, is important, if not essential, to understanding the present;
2. one's present perspective and efforts are necessary to rescue the past from falling into static oblivion, to capture its dynamic character, and to extend its influence;
3. attention to the thought of others is an essential feature of the development of one's own intellectual posture;
4. one's present perspective is necessarily a vital factor in a consideration of the thought of others.

The formulation of the six specific purposes suggests a dualistic intent: it might be seen as reflecting dualisms of past and present, and other and self. The former refers to turning attention to various doctrines in the history of philosophy of education, as well as to the contemporary scene. The latter signifies the effort to investigate the thought of various individuals who have attained some importance in philosophy of education, along with one's own reflection on similar kinds of questions.

A thorough course in the history of philosophy of education might well consider in some detail all four dimensions implicit in these dualisms—that is, (a) other thinkers of the past, (b) other thinkers of the present, (c) one's own past

reflections, and (d) one's own present state of development. Development of a course centered upon any one of the four dimensions alone does not appear to be satisfactory in light of the assertions stated above. Furthermore, in light of the assertions, deficiencies also appear in courses focused upon a and b alone (because of the omission of self-reflection), one devoted to c and d alone (because of the omission of concern for the other), one centered upon a and c alone (because of omission of attention to the present), and one directed toward b and c alone (because of omission of attention to past thinkers other than oneself and to one's own present thinking). In light of the terms used in the assertions, one could argue legitimately to the possibility of combining b and d alone fruitfully—in fact, those dimensions would be the basis of a course in Contemporary Philosophy and Education—although a more complete awareness (even of the present) could be had through attention to the past in a broader sense.

Among courses combining three of the dimensions in one course, only one seems to be thoroughly unsuitable, if not impossible, namely, a course concentrating on a, b, and c (because of the omission of one's present perspective). That leaves as viable possibilities four types of courses in terms of the inclusion of these dimensions: (1) a, c, d; (2) a, b, d; (3) b, d; and (4) a, d. Although the course in philosophy of education combining a, c, and d might be a "good" course, it does not appear necessary to consider c—self in the past (despite the potential interest and independent significance which such might provoke). Leaving aside further debate on the last point, we are left with three alternatives regarding the designated dimensions for a course in the history of philosophy of education—(1) a, b, d; (2) b, d; and (3) a, d.

Although these three possibilities are distinct, they also might be seen as unified. That is, a and b can be conceived of as the object of a single effort to consult the thought (pertinent to philosophy of education, of course) of others, a question remaining open being that of how far into the past and how close to—and including—one's own times one ought to go. The dimensions of a course resulting from this unified outlook might be designated as a-b and d, a suitable characterization of a general or survey course in the history of philosophy of education (which, it appears, would require an allotment of time greater than that of the usual three-credit semester course).

Recognizing the validity and importance of patterns other than history of philosophy of education in a graduate programme in philosophy of education, the following factors, nevertheless, tend to suggest the need for some emphasis upon philosophical analysis of the phenomenon of education in the perspective of history: (1) the appropriate manner in which the historical approach serves as an introduction to philosophy of education—by exposing the student to at least



somewhat of a variety of philosophical persuasions and topics; (2) the suitability of the historical approach for those with some background, needing a review of various philosophies of education; (3) the practicality of this approach for those who likely will not be pursuing philosophy of education in other formal courses in the future; (4) the usefulness of this approach in providing philosophical perspectives on education for one who intends to pursue specialized topics, eras, or movements in philosophy of education; (5) the ease with which this approach accommodates variety in the programme; and (6) the fittingness with which this approach suggests the intimate bond between philosophy, as such, and its historical development. From the point of view of the Christian, this kind of pattern in philosophy of education seems to reflect admirably the importance of heritage or tradition indigenous to Christian philosophies.<sup>5</sup>

Despite the extent and kind of attention afforded in these remarks to the pattern of graduate courses in philosophy of education designated as history of philosophy of education, it has been indicated above that this pattern is not seen as the only viable one. Despite insistence on a variety of patterns (which are by no means mutually exclusive) in a highly developed programme, the determination of the nature of a programme in a specific instance obviously depends in no small measure upon such circumstances as the number of faculty members available and the nature of their interests and competencies, and the number of actual and potential students. Furthermore, in planning a particular programme, the prominent role of philosophy courses other than those in philosophy of education must not be overlooked.

Due to the inherent complexities concerning this whole matter, as well as to the lack of detail here in regard to most parts of the general topic, several questions arise and include the following. How might it be possible to accommodate all or several patterns without undue repetition? What is the role of historical considerations within courses in patterns other than history of philosophy of education? What academic and professional background should be required of prospective students? What portion of the student's programme should consist of philosophy courses other than those in philosophy of education? What kind of general orientation and unity ought to pervade the programme and how can that be effected? Pertinent to the last question are differing perspectives (at least potentially) within and among state-supported universities, private non-religiously oriented universities, and private religiously oriented universities.

However these and other questions are answered, it appears obvious that in a graduate programme in philosophy of education, a coherent and logical sequence of courses ought to be developed, and its implementation ought to be fostered through sound teaching and research on the part of a faculty addressing itself to competent and industrious students.

NOTES

1. Some major philosophers have literally provided us with a philosophy of education in the sense intended here (for example, Plato); others have given attention to education somewhat peripherally (for example, Kant); and yet others have adverted to education minimally, if at all (for example, Kierkegaard). Although the challenge is of a somewhat different nature in these three categories, all three provide legitimate objects of investigation for philosophy of education.
2. See Heinrich Rommen, *Tradition: Heritage and Responsibility*, The McAuley Lectures, 1959 (West Hartford, Connecticut: St. Joseph College, 1959).
3. "Choosing a dimension of the past to confront intellectually" refers to the selection from among various possible sources by the teacher; "Choosing a dimension of the past in an intellectual confrontation" connotes the act of willing to investigate the principles presented.
4. These four statements will be referred to as "assertions" hereafter for purposes of clarity.
5. Although these remarks have been restricted to the portion of a graduate programme in philosophy of education commonly referred to as "course work", two other features of such a programme are the comprehensive or qualifying examination, and the thesis or dissertation. In regard to the former in history of philosophy of education, the student, in conjunction with his advisor, could choose for the object of the major portion of the examination the writings of specific individuals and/or certain books—the charge to the student being to explain, apply and evaluate each from his own philosophical perspective. The thesis or dissertation in history of philosophy of education could focus upon the pertinent efforts of one or more individuals, or one or more selected texts—or some combination thereof—and include exposition, interpretation, application, and evaluation, all within a context framed by the student's awareness (unsofar as is possible) of his own world-view.



*Analysing Relationship Among Multiple Data Sets for a Single Sample: A Methodological Appraisal*

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**F**REQUENTLY a psychologist or an educationist is required to study the relationship between two or more sets of measures on the same individuals. Let us consider a simple case of two data sets. Sometimes one set of measures may be designated as a set of predictor or independent measures, and other set may be

designated as a set of criterion or dependent measures. Thus a researcher may have measures on several ability variables and achievement variables and he may be interested in studying the interrelatedness between abilities and achievement variables. In another instance, the two domains may be conceptually different, but they may be measured concurrently on the subjects. Thus the researcher may have a set of measures on cognitions about certain stressful stimuli and a set of measures on reactions to those stressful stimuli and he may be interested in studying the interrelatedness of perceptions and reactions. The researcher is having a large number of alternatives to study these relationships. The simplest alternative is, of course, to examine the inter-set intercorrelations between all possible pairs of the two sets ( $R_{12}$ ) and simply discuss the bivariate relationships between pairs. The researcher may also think of utilising multiple regression procedures to study the relations between each of the criterion measures and the set of predictor measures. In search of a more parsimonious technique, the researcher may think of using canonical correlations wherein linear combinations of predictors are derived that maximally correlate with corresponding linear combinations of criterion measures. However, as Cooley and Lohnes (1971, p. 185) remark, "Although canonical correlations have been with us since Hotelling (1935) told us how to find 'the most predictable criterion', the psychological literature is not exactly full of examples of their application". Mulaik (1972) expresses the similar opinion. According to Cooley and Lohnes, there are two reasons for this, first, the availability of other alternative procedures, and second, the difficulty in interpreting canonical variates.

Apart from the above three alternatives familiar to most of the psychologists, there are other alternatives for this purpose in the factor analytic tradition. The most obvious of them is to factor analyse each set separately and relate the obtained factors in two or more data sets. While relating the factors in the two data sets, the researcher may rotate both the factor pattern matrices to maximum congruence or he may treat one of the factor pattern matrix as a target matrix and he may rotate the other factor pattern matrix to maximum congruence with the target matrix. The procedures for such transformations or rotation to maximum congruence have been suggested by Green (1952), Schönemann (1966), Cliff (1966), etc. and are available in standard factor analytic texts (e.g. Mulaik, 1972). These are certain exotic factor analytic procedures available for exploring relations among multiple data sets as interbattery factor analysis (Tucker, 1958; Kristof, 1967), multiple set factor analysis (Horst, 1965; Skinner, 1977a), longitudinal factor analysis (Corballis and Traub, 1970), etc. Golding and Seidman (1974), Jackson (1975) have addressed to the problem of factor analysing several sets in the context of multi-trait multi-method approach. McDonald (1970) has presented a generalization of Tucker (1958). An updating of McDonald's work is

found in Browne's (1980) 'factor analysis of multiple batteries by maximum likelihood'. Thus some of these techniques, for example, multiple set factor analysis, longitudinal factor analysis (Corballis, 1973) are applicable to study relationships in more than two data sets. In the approach based on canonical correlations, Horst (1961a, 1961b, 1965), Kettenring (1971) have proposed generalized canonical correlation. When the same set of variables is measured twice, say under two different conditions, Harris (1975) has suggested a modification of canonical correlation which requires that the same linear combination of each set of variables be employed in computer canonical correlation, rather than leaving the computing algorithm free to pick different canonical variates for the two sets. This line of work, suggested by Harris, deserves to be pursued further seriously. Similarly, for those researchers, who seek a single measure of association between the two data sets, certain indices are available, the earliest of them, dating to thirties, is based on Wilk's lambda (Wilk, 1935; Cohen and Nee, 1984). Cramer and Nicewander (1979) have described seven such measures, all of them being the functions of the canonical correlations. In this context, multivariate statistical theory has interfaced with information theoretical concepts (Phaner, 1966). Some additional ways of correlational analysis suitable for studying relations between two data sets can also be found in Larzelere and Muliak (1977), Steiger (1980). Thus an example of Steiger's case E (Steiger, 1980, p. 250) testing longitudinal stability of a correlation matrix may be cited in this context.

It is not possible for us in this limited space to review and critically discuss all these alternatives. However, one need not be bewildered with these multiple alternatives, since from the point of mathematical statistics, many of them can be shown to be the specific instances of a linear model. In fact, from this perspective, Skinner (1977 a) has discussed some conceptual and mathematical relationships among the various alternatives such as interbattery factor analysis, multiple regression, canonical correlation, generalized canonical correlation, longitudinal factor analysis and multiple set factor analysis. Based on this analysis, Skinner (1977a, b, 1978) has suggested an excellent strategy to explore predictor-criterion relationship.

It is thus clear that the problem of relationship between two or more data sets can be tackled through the factor analytic approach. The present author has a mild individual preference for the factor analytic approach as compared to canonical correlations, partly because of his familiarity with the former. To justify this approach, first let us briefly present some usual criticisms about canonical correlations and then offer some arguments in favour of the factor analytic approach. Further discussion of canonical correlations is, certainly, justified in view of the wide recognition of this technique to study relationship between two data sets in data analysis literature. The first criticism is that it is often difficult to interpret the

obtained canonical variates (Cooley and Lohnes, 1971). The second related criticism is aptly summarized by Wollenberg (1977), "Whereas in bivariate correlation and multiple correlation analysis the squared correlation coefficient is equal to the proportion of explained variance of the variables under consideration, this is not the case for the canonical correlation coefficient. Canonical correlation actually gives no information about the explained variance of the variables in one set given the other, since no attention is paid to factor loadings. Two minor components may correlate very highly, while the explained variance of the variables is very low, because of the near zero loadings of the variables on those components. As a high canonical correlation does not tell us anything about the communality of two sets of variables, it is as such an analytical tool which is hard to interpret" (Wollenberg, 1977, p. 208). To solve this problem, redundancy analysis, either as an addition or as an alternative to canonical correlation analysis has been proposed (Stewart and Love, 1968; Gleason, 1976; Wollenberg, 1977). In fact some texts on multivariate analysis, in chapters on canonical correlation, have started giving integrated treatment of canonical correlation and redundancy analysis (e.g. Cooley and Lohnes, 1971). The third criticism is related with the matter of fact that canonical correlation is 'external factor analysis' or more properly 'external component analysis'. In this context, a very fundamental point is raised by Maxwell (1977, p. 93), who, while commenting on canonical correlation, remarked that "the hypothetical variates derived from each of the two distinct sets of observed variates are not *principal* components of these sets. Rather they are components, which, in pairs, are related to each other in a regression sense (...) from one set of variates to the other and indeed seldom correspond to principal components themselves or correlate highly with them". In other words, when we do canonical correlations, we do not obtain the internal factorial structure of any of the sets in the traditional sense. Instead we merely derive the linear combinations of predictors that maximally correlate with linear combinations of criterion measures. This is certainly justifiable for a limited or pragmatic purpose of predicting the criteria from a given set of predictors. (It may be noted that the title of Hotelling's original paper on the subject (1935) was "The most predictable criterion"). However, if we want to build up some substantive theorization about the two data sets and their relationship, we ought to know about the factorial structure of each of the data sets independently and then the interrelation of the factors of one set with those of the other. Certainly for such a purpose, factor analysing each data set separately and relating the factors across the two data sets is an appropriate strategy.

The mention of these criticisms need not lead one to conclude that we undermine the role of canonical correlation analysis as a data analysis procedure when we are confronted with two data sets. In fact, canonical correlation analysis represents a mathematically elegant but complex procedure with its strengths as

well as weaknesses and limitations. The problems which we have posed in connection with canonical correlation analysis are not mathematically unsurmountable, but they arise partly because of our failure to take into consideration the recent formulations of canonical correlations and integrate this approach with other approaches. In fact it is possible to combine the benefits of the factor analytic approach and canonical correlation analysis in a single strategy or algorithm for analysing the relationship between two or more data sets and, as pointed out earlier, Skinner (1977a, b, 1978) has offered one of such excellent strategy. Skinner (1977a), based on Kettenring (1971), has shown the direct relationship between canonical correlation analysis and multiple set factor analysis. Thus a user, familiar with factor analytic terminology, may conduct multiple set factor analysis and still get the information supplied by canonical correlations. The unrotated multiple set components, after some calculations, would provide the information which is otherwise supplied by canonical correlation analysis. Moreover, the unrotated multiple set components may be further rotated to increase interpretability. The consequences of this rotation or the possibility of straightway rotating canonical variates needs to be thoroughly researched and an influential beginning in this direction has been made by Cliff and Krus (1976). It is thus clear that the problem of studying the relationship between two or more data sets can be efficiently tackled through factor analytic approach and that many factor analytic procedures which have not been till now used for studying the relationship between two or more data sets may now be put to use for this purpose.

Many of the alternatives outlined above are exploratory in nature. Certainly this is an impressionistic statement, subject to several exceptions and reservations. This broad statement is inevitable, since we have not examined each of the alternatives in sufficient detail. For example, as an exception, we may point out that while factor analysing each of the data sets separately and then relating the factors across two data sets, one can do hypothesis testing. However, since it is possible to study the relationship between the two data sets through the factor analytic approach, at least in principle, we should be able to extend the same hypothesis-testing procedures in factor analysis to evaluate the hypothesis of specified relationships in the two data sets. The two major factor analytic procedures employed for hypothesis testing purpose in single data sets are—the multiple-group factor method and the confirmatory factor analysis procedures. The first one is conceptually and computationally quite simple. The confirmatory factor analysis procedures, pioneered by Jöreskog (1969), are computationally quite sophisticated as well as complex. Attempts should be made to extend both, multiple-group factor analysis as well as confirmatory factor analysis, to two or more data sets. Multiple-group factor analysis has been successfully applied to study the relationship between two data sets (Lodhi, 1988). The results obtained

through a simple method like the multiple-group factor method need to be compared with those obtained through the more sophisticated confirmatory analysis methods available in computer programmes such as LISREL.

In sum, it may be concluded that there is no dearth of exploratory methods to study relationship between two or more data sets. The current research, therefore, needs to be focused on developing methods to evaluate hypothesis of relationship between two or more data sets. Such methods are really needed for theory-testing research involving more than one domain of variables.

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### *Achievement of First and Non-first Generation Pupils*

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A NATION with a maximum number of literates is considered to be financially better than that of less literates. Literacy removes superstition which stands in the way of progress of a country. Nearly 60 per cent of population in India are



illiterates, the reason being deprivation of education for generations together. During the last century, had the peasants (ours being an agricultural country) been able to read and write, the present rate of literacy would have gone high. This is not so because the illiterate parents did not send their children to schools owing to many reasons. Lack of awareness, political and cultural, is one of the many reasons for the continuance of illiteracy. The illiterate parents who were aware of the fruits of education joined their children in schools. These children form the first generation, for they are first to have education in their familial tree. However, in the mainstream are normal groups of children of the literate parents. These children are thus known as non-first generation in contrast to first generation.

The first generation children, mostly tribal, do not continue their studies at school because of various reasons—different cultural backgrounds, different SES, etc. Keeping this in view, the Education Commission recommended that careful arrangement should be made for giving personal guidance and some extra tuition (remedial instruction) to these pupils, so that they will be able to perform better in comparison with non-first generation, mostly non-tribal, pupils. The Andhra Pradesh state government recommended that children coming from illiterate families and seeking education should be given admission in government residential schools, irrespective of their performance in the entrance examination. An UNICEF-financed study found that residential schools were favoured in this connection.

## THE PROBLEM

The present study focussed on the achievement of first and non-first generation in a residential school in Karimnagar, Andhra Pradesh. It intended to highlight achievement in relation to parental education, nature of the subject, SES, and exposure effect. So far as the knowledge of the investigator goes there were no studies conducted on this problem. Thus, to varify and reiterate the views of the above commissions, it was felt pertinent to study the apparent disparity between first generation and non-first generation.

## OBJECTIVES

The study was conducted with the following objectives:

1. Difference in achievement between first and non-first generation.
2. Achievement of language and non-language subjects in first generation.
3. Language achievement in first and non-first generation.

4. Difference in achievement between two terms, i.e. quarterly and half-yearly examinations.
5. Achievement of non-first generation with respect to SES.

## HYPOTHESES

The following hypotheses were formulated for the study:

1. There is no difference in the achievement of first and non-first generation.
2. There is no difference in the achievement of language and non-language subjects in first generation.
3. There is no difference in the achievement of language in first and non-first generation.
4. There is no difference in achievement between first and second term examinations.
5. There is no difference between the achievement of high SES and low SES in non-first generation.

## THE DESIGN

The experimental design opted for the study is a Static Group Design or Intact Group Design under the category of Pre-experimental Designs. This design may be represented as

$$\frac{X O_1}{C O_2}$$

The variables and observations under study are as follows:

For the first hypothesis, the independent variable is the influence of parental education on their offsprings, the dependent variable being achievement. Hence, the observations included scores of both FG and NFG generation. The second hypothesis, intended to observe the achievement of language and non-language, has nature of subject and achievement as its variables. The third hypothesis again is related to the influence of parental education on children (as in the first hypothesis) but studies how the achievement of language is dependent upon it. The observations include the achievement of both FG and NFG. The fourth hypothesis is to find the exposure effect and achievement. The observations made consisted the scores of first and second terms. The fifth hypothesis considers SES among FG upon which achievement is dependent. The variables and observations for each of the aforesaid hypotheses are given in Table 1.

**TABLE 1**  
**Variables and Observations for the Hypotheses under Study**

Sl. No.	Variables		Observations	
	Independent	Dependent	One	Two
1.	Influence of parental education on children	Achievement	Scores of first generation (no influence)	Scores of non-first generation (influence)
2.	Nature of the subject	Achievement	Scores of languages	Scores of non-languages
3.	Influence of parental education on children	Achievement in languages	Scores of first generation	Scores of non-first generation
4.	Exposure effect	Achievement	Scores of first term	Scores of second term
5.	Socio-economic status in non-first generation	Achievement	Scores of high SES	Scores of low SES

From the above table it is clear that the present study intended to find out how far achievement is dependent upon independent variables, namely, influence of parental education, nature of subject, exposure effect, and SES. The observations made pertain to the variables to quantify dependence and clarify in the conclusions drawn from them.

## DATA COLLECTION

### *Sample Selection*

Vivakananda Residential School in Karimnagar (a district headquarter in Andhra Pradesh) was selected for the study. The sample consisted of 50 pupils of Classes IV to VIII in the age-group 9-13 years.

### *Tool Development and Administration*

Based on the objectives, a list was drawn on the information to be had from the pupils—term-wise performance and SES (parents' education, occupation, monthly income, education of the siblings and size of the family). Information on the achievement of the pupils in quarterly and half-yearly examinations was collected from the concerned class teachers.

## DATA ANALYSIS AND INTERPRETATION

Details of the pupils' SES and their achievement are given in Table 2.

It is clear from Table 2 that the sample consisted of 10 FG and 40 NFG. In FG, the pupils coming from small-size families (family size four and below) are 20 per cent while the rest hail from families of 5 to 9 members. The percentage of FG at

TABLE 2  
Pupils' Socio-economic Status and their Achievement

TABLE 2																
Pupils' Socio-economic Status and their Achievement																
SL No.	Name	Family Size	No. of Bros.	No. of Sisters	Educational Status				Mthly. Income	Occupation	Achievement					
					Father	Mother	Bros.	Sisters			Quarterly		Half-yearly			
											L	NL	TM	L	TM	NL
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1.		5	1	1	—	—	1KG	—	1200	Agr.	72	78	75	76	87	81.5
2.		9	2	4	—	—	6LKG	9,6,3, LKG	2000 ab.	Cont.	58	58	58	73	81	77
3.		5	—	2	—	—	—	5,5	"	Ornman	79	71	75	71	87	79
4.		5	1	1	—	—	10	9	"	Cont.	76	76	76	79	78	78.5
5.		4	—	1	—	—	—	5	1200 to 1600	Chit fund	48.5	49.5	49	49	47	48
6.		5	—	2	—	—	—	2,5	2000 ab	Business	50	47	48.5	58.5	59.5	59
7.		4	1	—	—	—	4	—	"	"	77	81	79	78	84	86
8.		7	1	3	—	—	10	10	"	"	59	79	69	73	85	79
9.		5	—	2	—	—	—	4,6	"	"	74	84	79	79	85	82
10.		5	1	1	—	—	10	6	"	"	64	73	68.5	65	75	70
11.		5	—	2	10	8	—	3,1	1200	"	73	87	79.5	87	95	91
12.		5	1	1	10	10	—	10	2000 ab.	Cont.	49	68	58.5	59	73	66
13.		4	—	1	9	7	—	3	1600 to 2000	Mer.	54	79	66.5	78	83	81
14.		9	2	5	Degree	—	5UKG	10,9,1, UKG	2000 ab.	"	53	65	59	61	72	67
15.		6	2	1	10	5	LKG	5	1200	Filter	53	84	68.5	72	72	72
16.		6	—	3	Degree	7	—	10,9,4	1200 to 1600	UDC	55.5	64.5	60.5	67	79	73

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
17.		5	1	1	10	—	2	UKG	1600	RTC	80	86	83	88	90	89
18.		4	—	1	Degree	5	—	10	1600	Agr.	76	62	69	90	94	92
19.		5	1	1	"	10	—	1	2000	Man- ager	74	81	77.5	75	79	77
20.		6	—	3	FUC	10	—	8,8,4	1600 to 2000	Forest Off.	81	87	84	88	95	91.5
21.		6	2	1	10	6	UKG	—	2000	LIC	51	72	61.5	74	89	81.5
22.		4	—	1	10	2	—	1	1600 to 2000	Fuller	38	65	51.5	56	77	66.5
23.		4	1	—	10	10	7	—	2000	Cont.	62	62	62	61	74	67.5
24.		6	1	2	5	Inter	LKG	3,1KG	2000	Mer.	59	70	64.5	75	83	79
25.		4	1	—	Degree	—	UKG	—	1600	Bus.	51	64	56.5	59	78	68.5
26.		4	—	1	10	—	—	2	1200	Cont.	44	58	51	48	77	59.5
27.		4	1	—	10	6	3	—	2000	Cont.	48	33	40.5	54	45	49.5
28.		5	1	—	Degree	10	—	—	1200	Elec.	67.5	61.5	64.5	81	65	73
29.		6	1	2	MBBS	Degree	9	7, Inter	2000	Doctor	71	85	77.5	86	72	81.5
30.		5	1	1	9	10	10	4	"	Bus.	41	34	37.5	56	40	48
31.		4	1	—	BE	7	3	—	"	Cont.	51	55	53	57.5	59.5	58.5
32.		3	—	—	Degree	—	—	—	2000	Cashier	66	74	70	87	71	79
33.		5	1	1	MBBS	Inter	2	4	2000	Doctor	49	48	48.5	56	42	49
34.		4	—	1	10	7	—	10	1600	Mer.	58	56	57	69	68	68.5
35.		4	—	1	Degree	Inter	—	Inter	2000	Cont.	39.5	49.5	44.5	36	60	48

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
36.			4	—	1	PG	10	—	4	2000	Lect.	49	56	52.5	48	46	46.5
37.			4	—	1	Degree	10	—	5	1600	Ag.	46	47	46.5	52	62	57
38.			4	1	—	P. Tech.	10	10	—	2000	APSEB	36	31	33.5	49	49	49
39.			6	1	2	Degree	—	1	4	1600	Miner	34	27	30.5	48	43	45.5
40.			5	2	—	10	7	2.4	—	2000	Bus.	46	38	42	53	45	48.5
41.			4	—	1	Inter	8	—	1	—	—	65	65	65	66	50	58
42.			6	1	2	Degree	Degree	Inter	5 Deg.	—	Cont.	55	51	53	59	39	49
43.			6	1	3	—	—	LKG	—	—	Bus.	52	51	51.5	41	57	49
44.			5	1	1	—	10	UKG	—	—	Clerk	58	79	68.5	48	69	58.5
45.			4	1	—	—	MBBS	—	—	—	Bus.	71	67	69	68	70	69
46.			5	1	1	—	Inter	1	2	—	Police	50	87	68.5	77	85	81
47.			4	—	1	10	8	—	MBBS	—	Mer.	36	40	38.5	42	49	45.5
48.			5	1	1	PUC	PUC	6	7	1600	H.I.	33	39	36	49	48	48.5
49.			4	—	1	B.E.	—	—	6	2000	Eng.	42	74	58	59	78	68.5
50.			5	—	2	MBBS	B.Ed.	—	—	—	Doctor	38	46	37	49	48	48.5

L = Mean of Language subjects; NL = Mean of Non-Language subjects; TM = Mean of all subjects put together; Agr. = Agriculture; Mer. = Merchant; Cont. = Contractor; Bus = Business; Eng. = Engineer; H.I. = Health Inspector; Elec. = Electrician; Lect. = Lecturer  
ab. = above

the High School stage is 28.5. Parents of 80 per cent FG are businessmen while the remaining work as labourers. The economic status of this group is dependent on the occupations—monthly income rupees 2000 and above for businessmen and less than rupees 2000 per month for labourers.

Among NFG, the pupils coming from small-size families are 45 per cent while the remaining hail from families of 5 to 9 members. The percentage of pupils in high schools is 26, the remaining being in primary schools and colleges. Even among NFG 20 per cent of female parents are illiterate while 12.5 per cent of the literates are graduates. The educational status of male parents: post-graduates—15%; graduates—45%; intermediate PUC—10%; Matriculation/SSC—30%. Parents of 40 per cent NFG are businessmen while the remaining work as doctors, clerks, and as officials in various fields. Here too, the economic status is dependent on the occupations—monthly income rupees 2000 and above for businessmen and professionals, and below rupees 2000 for others.

The investigator calculated the mean and standard deviation for FG and NFG, to have a clear understanding of the achievement of the pupils in all possible ways, namely, language, non-language and all subjects put together. The results are shown in Table 3.

TABLE 3 Term-wise Performance of the Pupils						
Sl. No.	Subjects	Type of Pupils				Term
		First Generation (FG)		Non-first Generation (NFG)		
		M	SD	M	SD	
1.	Lang	65.7	11.3	53.75	13.4	Q
2.	Non-Lang	69.6	13.6	61.0	18.0	Q
3.	All	67.5	11.7	57.5	14.3	Q
4.	Lang	70	9.8	64.25	14.6	HY
5.	Non-Lang	76.8	12.9	67.25	15.7	HY
6.	All	74	11.8	65.75	14.6	HY
M = Mean; SD = Standard Deviation						

The above table reveals the following:

1. The achievement of all the subjects put together is greater for FG than NFG.
2. The mean of non-language is higher than language subjects.
3. The achievement of language is greater for FG than NFG.
4. The achievement in half-yearly is higher than in quarterly examinations.

These are the four of the five objectives in the present study. The investigator applied statistical tests to find how far the aforesaid objectives were valid.

First, the achievement of FG and NFG term-wise, is calculated and then t-values are obtained for the same to show their significance. The values of the first hypothesis are given in Table 4.

TABLE 4 Achievement of All Subjects Put Together and their t-values										
Sl. No.	Achievement						Term	t-value	df	Level of Significance
	First Generation			Non-first Generation						
	M	SD	N	M	SD	N				
1.	67.5	11.7	10	57.5	14.3	40	Q	2.32	48	0.05%
2.	74.0	11.1	10	65.75	14.6	40	HY	1.89	48	NS
M = Mean; SD = Standard Deviation; N = Number of Pupils										

It is clear from the above table that there is a difference between the achievement of FG and NFG, and hence the first hypothesis is rejected. The t-value, 2.32, in quarterly examination is significant at 0.05 per cent level. However, the values in half-yearly examinations are non-significant. Obviously, then, it may be concluded that the achievement of FG is greater than NFG, but requires further study on a large sample to establish it.

Similarly, for the second hypothesis, statistical values are calculated to find the level of significance. This is shown in Table 5.

TABLE 5 Achievement of Language and Non-Language Subjects and their t-values											
Sl. No.	Type	Achievement						Term	t-value	df	Level of Significance
		Language			Non-Language						
		M	SD	N	M	SD	N				
1.	FG	65.7	11.3	10	69.6	13.6	10	Q	0.70	18	NS
2.	NFG	53.75	13.4	40	61.0	18.0	40	Q	0.74	78	NS
3.	FG	70.0	9.8	10	76.8	12.9	10	HY	1.32	18	NS
4.	NFG	64.25	14.6	40	67.25	15.7	40	HY	0.98	78	NS

The second hypothesis is related to the nature of the subject and its achievement. The t-values calculated are less than the table values and so the hypothesis is accepted. The apparent mean difference may be due to chance factors. Thus, it may be concluded that the achievement of language and non-language is same among FG.



For the third hypothesis, term-wise mean, SD and t-values of language achievement in both FG and NFG are calculated. These are shown in Table 6.

TABLE 6 Achievement of Language and their t-values for FG and NFG										
Sl. No.	Achievement of Language						Term	t-value	df	Level of Signi- ficance
	First Generation			Non-first Generation						
	M	SD	N	M	SD	N				
1.	65.7	11.3	10	53.75	13.4	40	Q	2.9	48	0.01%
2.	70.0	9.8	10	64.25	14.6	40	HY	1.5	48	NS

The third hypothesis regarding the achievement of language in FG and NFG is rejected because the values obtained are significant at 0.01 per cent level. From this, it may be inferred that the achievement of language for FG is higher than NFG. Thus, parental education does not have much influence on their pupils' achievement of language.

Finally, the statistical values for the fourth hypothesis are calculated. The mean, SD of quarterly and half-yearly examinations for both FG and NFG are given in Table 7.

TABLE 7										
Achievement in Half-yearly and Quarterly Examinations and their t-values										
Sl. No.	Type	Achievement						t-value	df	Level of Significance
		Quarterly			Half-yearly					
		M	SD	N	M	SD	N			
1.	FG	67.5	11.7	10	74.0	11.8	10	1.23	18	NS
2.	NFG	57.5	14.3	40	65.75	14.6	40	2.55	78	0.02%

The fourth hypothesis that there is no difference in the achievement between first and second term examinations is rejected. The values from the table reveal that mean, 67.75, in half-yearly is greater than that of quarterly, 57.5 for NFG. The hypothesis is significant at 0.02 per cent level. Thus, it may be inferred that achievement in half-yearly is greater than that of quarterly for NFG.

The investigator then calculated the percentage of pupils getting first class, second class and less than second class, and subject-wise in each of the categories—Total (high and low SES put together), High and Low SES, separately. These details are shown in Table 8.

Table 8 reveals that the achievement in quarterly examinations of the FG pupils with high SES (monthly income rupees 2000 and above) who secured first class (60 per cent and above marks) is 60 per cent while that of NFG it is 17.5 per cent. But

**TABLE 8**  
**Percentage of Pupils Class-wise and SES-wise**

TABLE 8 Percentage of Pupils Class-wise and SES-wise																				
Sl. No.	Type	Class-wise						Subject-wise								Term				
		First			Second			Less than Second			More in Languages			More in Non-Languages			Equal in Lang. and Non-Lang.			
		T	H	L	T	H	L	T	H	L	T	H	L	T	H			L		
1.	FG	70	60	10	10	10	—	20	10	10	20	20	—	60	40	20	20	20	—	Q
2.	NFG	45	17.5	27.5	27.5	15	12.5	27.5	20	7.5	30	20	10	65	27.5	37.5	5	5	—	Q
3.	FG	80	70	10	10	10	—	10	—	10	30	20	10	70	60	10	—	—	—	HY
4.	NFG	55	22.5	32.5	12.5	7.5	5.0	32.5	25	7.5	35	17.5	17.5	60	27.5	32.5	5	2.5	2.5	HY

H = High; L = Low; T = Total of H and L; Q = Quarterly; HY = Half-yearly

for low SES (monthly income below rupees 2000), it is 27.5 per cent for NFG and 10 per cent for FG. The pupils getting less than first class in high SES in FG is 20 per cent as against 35 per cent NFG. But for low SES in the same NFG it is 20 per cent and for FG it is 10 per cent.

The pupils' achievement is more in half-yearly than in quarterly examinations. As a consequence, the pupils falling under higher grades increased. The pupils of high SES securing first class are 70 per cent and 22.5 per cent in FG and NFG, respectively. The low SES pupils in FG in first class are 10 per cent against 32.5 per cent in NFG. The pupils of high SES in the less than first class category are 32.5 per cent from NFG and 10 per cent from FG. But in low SES and less than first class category NFG is 12.5 per cent and FG is 10 per cent.

The above discussion makes it clear that there is difference between the achievement of high SES and low SES in NFG. This is the fifth objective in the present study.

The investigator applied statistical tests to find out how far the above objective is valid. The values of such tests are given in Table 9.

TABLE 9								
Achievement of High and Low SES and their t-values for NFG								
Sl. No.	Non-first Generation				Term	t-value	df	Level of Significance
	SES	M	SD	N				
1.	H	53.9	14.2	21	Q	1.51	38	NS
2.	L	61.55	17.4	19	Q			
3.	H	59.8	11.1	21	HY	3.03	38	0.01%
4.	L	72.0	14.2	19	HY			

The fifth hypothesis that there is no difference between the achievement of high SES and low SES in NFG is rejected. The mean for low SES, 72.0, is greater than high SES, 59.8, in half-yearly examinations and the t-values show that the hypothesis is significant at 0.01 per cent level. Thus, it may be concluded that the achievement of low SES is greater than that of high SES in NFG.

## SUGGESTIONS

The major finding of the present study is that FG pupils can perform better than NFG pupils if conducive environment is provided. Hence, the investigator suggests that more residential schools be opened to improve the academic standards of FG.

The other important conclusion of the study is that the achievement of non-language is higher than that of language subjects. Language subjects appear to be easy and their teaching is perhaps being neglected. This may be one of the many reasons

for low achievement in language. Hence, the teachers are advised to teach language for its thorough comprehension.

The study was limited to a small sample of 50 students and the conclusions drawn may not be generalised even though statistical treatment shows that it can be done. Hence, a study may be taken up with a large sample of varied subjects to establish the hypotheses of this study at a suitable significance level.

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#### *Effect of Dependence Proneness and Demonstration on Verbal Problem-solving in Eighth and Ninth Grade Children*

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COGNITIVE style has been reported as one of the important components of pupil's entering behaviour which influence their performance on a variety of cognitive tasks. Experimental investigations in this area have included a number

of cognitive style dimensions, on the one hand, (Witkin et al., 1954; Bruner et al., 1956; Kagan et al., 1964, 1966) as independent variable and various psychological functions (Nassari and Schack, 1972; Kilburg and Siegel, 1973; Massari, 1975; Mitchell and Ault, 1979), on the other, as dependent measure. Recently, researchers have attempted to study the role of cognitive style in thought processes like problem-solving and reasoning in children (Kagan et al., 1964; Odom, McIntyre and Ncale, 1971; Adams, 1972). For example, Klein et al. (1976) studied the relationship between reflection-impulsivity dimension of cognitive style and its relationship with problem-solving. They have reported that response selection and evaluation are the key processes involved in problem-solving and there are significant qualitative differences between reflective and impulsive children leading to differential performance.

A verbal problem-solving task in which the problem and its structure is presented semantically requires certain cognitive abilities. For example, ability to differentiate and analyse the problem into its components, to visualise the inter-relationships between components, to arrive at and evaluate different possible solutions are essential for efficient problem-solving. Cognitive style dimensions reflect a tendency of an individual's cognitive processes to occur in one or the other way where a task requires such cognitive abilities.

Social dependence proneness has been conceptualised as an extension and generalization of field-dependence-independence dimension of cognitive style (Tiwari, 1981), into those behavioural situations which involve social stimuli. A number of studies have been reported in which social dependence proneness has been manipulated as a measure of cognitive style and its relationship with some cognitive functions like concept identification (Tripathi, 1986), decision making (Sinha and Pandey, 1970b) tolerance of unrealistic experiences (Klein et al., 1962), syllogistic reasoning (Tiwari and Tripathi, 1981) has been explored and it has been reported that these processes are functionally related with dependence proneness cognitive style.

The present experiment was conducted to study the relationship between dependence proneness and problem-solving behaviour with a different kind of verbal problem traditionally not used in experimental studies of problem-solving. The task required its segmentation into components based on perceived meaning of the sentences and comparison among different segments. On the basis of the conceptualization of dependence proneness cognitive style and the evidences about its influence on various cognitive functions, it could be predicted that low dependence prone subjects would solve the problems more efficiently as compared to high dependence prone subjects. The first purpose of the present experiment was to experimentally examine the stated prediction.

The second purpose of the present experiment was to study the effect of demonstration on improvement, if any, in the performance. It has repeatedly been observed that in a classroom situation, all the pupils do not profit equally with important instructions (Zelniker and Oppenheimer, 1976). It has been agreed upon by educational psychologists that thorough knowledge of individual differences is essential for teachers to meet the needs of each learner in the classroom because individual differences among learners are responsible for differential gains from instructions (Ausubel, 1968). Cognitive style dimensions describe one set of individual differences which affect the general mode of cognitive functioning. A large number of studies (e.g., Satterly and Brimer, 1971; Kipnis, 1971) have reported that impulsive subjects are at disadvantageous position in various learning situations. To deal with the apparent disadvantage of impulsive children, some researchers (e.g. Albert, 1970; Zelniker et al., 1972; Egeland, 1974, Zelniker and Oppenheimer, 1976) have attempted modification of their cognitive style and have reported that these attempts are not equally useful for all the individuals. The second purpose of the present experiment was to investigate the effect of demonstration and the interaction effect of demonstration and dependence proneness on verbal problem-solving. Keeping in view the previous findings, it was hypothesized that there would be differential effect of demonstration on the problem-solving of the individuals with high and low degree of dependence proneness.

## METHOD

### *Subjects*

One hundred and twenty boys studying in eight and ninth grades, their age varying between 12 to 15 years served as subjects. They were selected on the basis of their scores on the Dependence Proneness Scale (Tripathi, 1986). This scale was administered to more than 250 students and their scores made it possible to select 60 respondents from the upper (HDP group) and 60 respondents from the lower extremes (LDP group) of dependence proneness scores.

Problem-solving ability has been traditionally evaluated in the measurement of intelligence. In order to remove the possible confounding effect of intelligence, the HDP and LDP groups were matched on intelligence. All the subjects along with 20 more randomly selected boys of the same grades were administered the BPT-15 intelligence test (Psychological Bureau, Allahabad). The means and standard deviations of HDP and LDP groups arrived at 48.0 and 53.20; and 9.5 and 12.0, respectively. The means were found to be significantly different ( $t = 2.64$ ,  $df = 118$ ,  $p = .01$ ). To match the groups, some subjects from both the groups were

replaced by some of the extra 20 subjects, keeping in view their dependence proneness scores. This was done in a way that resulted in the difference between means to the tune of 1.9. The t-test was again applied and it was found that the intelligence of both the groups was not significantly different from each other. A one-way analysis of variance was run and the results ( $F = 32.60$ ;  $df = 1/118$ ,  $p = .01$ ) indicated that the two groups HDP and LDP were significantly different with respect to their dependence proneness scores.

### *Material*

A standardized verbal problem-solving task was used in the present study. This task was selected from a standardized intelligence test (BPT-15, Psychological Bureau, Allahabad). The problem consisted of ten Hindi sentences and their translation in a coded language. The subjects' task was to search out the synonym words for some Hindi words.

### *Demonstration*

A standardized demonstration was prepared to instruct the subjects about how to apply reasoning in such problem-solving tasks. The demonstration was printed in Hindi on a sheet of paper. There were a few examples of Hindi sentences with their coded translations with a procedure describing how to discover the code of any Hindi word.

### *Design*

The experiment was conducted in  $2 \times 2$  (DP  $\times$  Demonstration) mixed factorial design in which DP was manipulated with subject selection technique at two levels: HDP and LDP, and demonstration variable was directly manipulated at two levels: demonstration and no demonstration. The number of correct solutions given by the subjects was dependent measure.

### *Procedure*

The HDP and LDP groups of the subjects were randomly divided into two sub-groups. Half of the subjects of the HDP and LDP groups were put in 'no demonstration' condition. These subjects did not receive any demonstration prior to the administration of problem-solving task while other half of the subjects were put in 'demonstration condition' and were imparted with demonstration immediately after general instructions. The experiment was conducted individually in a laboratory situation.

## RESULTS

Table 1 presents the means and standard deviations of the correct solutions given by the subjects in different experimental conditions.

TABLE 1 Mean and SDs of Correct Solutions Given by Subjects of Different Experimental Conditions				
	HDP		LDP	
	Mean	SD	Mean	SD
No Demonstration	4.37	2.20	5.33	2.90
Demonstration	6.80	2.41	8.23	2.12

A  $2 \times 2$  (Dependence Proneness  $\times$  Demonstration) ANOVA was run in which both the independent variables were at two levels and the number of correct solutions were dependent measure. The analysis of variance revealed statistically significant main effects of dependence proneness  $F(1/116) = 8.32, p = .01$ , with higher mean value ( $M = 6.78$ ) of the LDP group than the HDP group ( $M = 5.58$ ) and demonstration,  $F(1/116) = 32.45, p = .01$ , with higher mean value ( $M = 7.51$ ) in 'demonstration' condition than in 'no demonstration' condition ( $M = 4.85$ ). The dependence proneness  $\times$  demonstration interaction effect was not found to be significant.

## DISCUSSION

The findings reveal a significant difference between the performance in problem-solving by high and low dependence prone persons and that low dependence prones are more efficient in such tasks than high dependence prones. These findings are in predicted direction and can be explicated on the basis of cognitive characteristics associated with high and low dependence prone individuals and the psychological processes involved in the type of cognitive task used in the experiment. High dependence prone individuals' cognitive style is global, i.e. they have lesser capacity to analyse and differentiate the total stimulus pattern into its constituent components. They are more prone to perceive the total stimulus situation as a whole. It has been reported that instead of adopting an active and versatile approach towards the task, the subjects with global cognitive style take a passive approach to solve a problem involving reasoning. Furthermore, their capacity to use memory in information processing is very limited (McKinney, 1975). The task used in the present experiment requires certain specific cognitive abilities simultaneous deciphering a code and evaluating its correctness with other



evidences. It requires an analytical and differentiated approach towards the problem. Evaluation of the final outcome by fitting it into the whole composite of sentences is also a necessary step to do correct reasoning. It appears that high dependence prone subjects with a global cognitive style do not as correctly perceive and extract the code and compare it's correctness in other sentences. The evaluation stage of the processing is also likely to be influenced by dependence proneness of the individuals. The correctness of the final response depends on the time and concentration given to its evaluation. The HDP subjects being impulsive in their behaviours (Tripathi, 1986), eject their response immediately when it comes to their mind without evaluating them properly.

In order to avoid the confounding effect of general intelligence, the HDP and LDP groups were statistically matched on the intelligence test scores based on a composite battery of verbal intelligence tests. During the matching procedure a significant difference between the intelligence of the HDP and LDP subjects was observed. The finding that the HDP and LDP subjects differ in problem-solving abilities, raises some questions to be clarified. The most important issue is whether there is any relationship between dependence proneness and intelligence and whether the difference in performance on problem-solving by the HDP and LDP subjects could be attributed to the differences in intelligence. The later possibility cannot be accepted because the two groups were matched on intelligence. An offshoot of the present investigation which requires further research is that problem-solving ability being one of the important components of intelligence is not correlated with dependence proneness cognitive style while one or the other component may be so.

The main effect of demonstration on performance has also been found statistically significant. The results indicate that demonstration in problem-solving can improve the performance. This finding is corroborative to some other experiments (Zelniker and Oppenheimer, 1976) in which performance improvement has been recorded as a function of various techniques of instructions. The demonstration  $\times$  dependence proneness interaction effect was not found to be significant. Since cognitive style refers to the manner and process through which an individual cognizes the outer environmental inputs, it was thought that there would be differential effect of demonstration on the HDP and LDP subjects. But, the present findings do not support such hypothesis. There may be different reasons to which such finding can be attributed. The demonstrations were too exhaustive and obvious and perhaps there was nothing hidden to be comprehended by the subjects on their own. It appears that the nature of the task and the demonstration were responsible for equal gain from demonstration for both the groups. It would be an interesting hypothesis to study in further experiments that the differential gain from the demonstration by the subjects having different degrees of dependence

proneness depends on the degree of clarity or hiddenness in demonstration. It seems that the more is the opportunity to comprehend the instructions after analysing it on their own, the more the possibility is there for greater improvement in the performance of low dependence prone subjects. In educational settings where subjects are given only hints or clues for further reasoning and problem-solving, only the pupils with LDP improves themselves more than their counterparts. However, the present investigation indicates that dependence proneness is an important component of the entering behaviour of subjects and the effect of demonstration on performance in problem-solving shows a trend that LDP subjects gain slightly more (not up to statistical significance) than HDP subjects.

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### *Psychological Strategies for the Educational Development of Socially Disadvantaged Groups*

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**A**MELIORATION of weaker sections in our society, of late, is receiving somewhat higher priority than what it used to be in the past. The state of Andhra Pradesh is in the forefront in spending amounts on the educational development of the socially disadvantaged children, particularly scheduled castes and scheduled tribes by way of creating hostel facilities and residential schools for them. It is not surprising to note that there are as many as 2,210 hostels and 64 residential schools exclusively for scheduled caste students in the state. In addition to this, students of +2 and degree level are provided with social welfare scholarships to reside in self-managed hostels numbering 839. As many as 2,13,732 students reside in

social welfare hostels. About 50,000 students at +2 and undergraduate level residing in self-managed hostels derive benefits from the Social Welfare department. As much as 93.40 crores of rupees are spent on the educational facilities of scheduled caste students per year. Considering the fact that large amounts of money are being pumped into the educational facilities of scheduled caste and scheduled tribe students, the gains on the educational front are not very much striking because of the low quality schooling, improper planning and inadequate living conditions in the hostels. At one point of time the Department of Education was very much worried for not getting trained graduates from scheduled castes in filling 200 teacher posts in mathematics and sciences that were reserved exclusively for scheduled caste candidates. A peripheral survey revealed that scheduled caste students generally do not opt for mathematics or sciences as compared to students from general population. The Department of Social Welfare of the Government of Andhra Pradesh, prompted by the Directorate of Public Instruction, assigned an action research programme to the Department of Psychology, Osmania University, in 1983 to find out reasons for the low profile of scheduled caste students in their studies, more particularly their performance in mathematics and sciences. Two studies that could throw light on the general mental ability and aptitudes and the desired effects of interventions on the classroom performance of scheduled caste students are reported here, as they are considered to be important for suggesting psychological strategies.

Before the findings of these two studies are presented it is necessary to know about social disadvantagedness in the Indian context.

According to H.C. Lendgrec (1976), "socially disadvantaged children are those who grow up in various cultures or sub-cultures outside the middle-class culture. They make up a sizable proportion of school population in most countries of the world. The common denomination that characterises these children is poverty, and the majority of them live in urban and rural slums".

If this definition is to be adopted for Indian society, at least 70 to 80 per cent of population, irrespective of their castes and creeds, can easily be described as socially disadvantaged but that is not the case with our type of social disadvantagedness. Social disadvantagedness in the Indian context must fulfil two basic criteria:

1. Poverty
2. Deprivation of normal social interaction with the persons of mainstream thus resulting in social isolation and cultural anomie.

If we keep these criteria in mind, scheduled castes and scheduled tribes are the two main types of population that can be strictly described as socially disadvantaged. Untouchability practised by the caste Hindus from time immemorial is the main cause of disadvantagedness in the Harijans. Geographical isolation coupled with cultural deprivation is the root cause of social disadvantagedness among the

tribals. By economic amelioration alone we cannot bring them into the main-fold and, therefore, it is necessary to think of psychological strategies and social development programmes. The present paper mainly focuses on the psychological strategies by way of presenting the findings of two studies that were carried out in 1986 as a part of the Educational, Vocational Guidance and Training project at the Department of Psychology, Osmania University.

#### STUDY 1: A COMPARISON OF SCHEDULED CASTE CHILDREN WITH NON-SCHEDULED CASTES AS REGARDS THEIR GENERAL MENTAL ABILITY AND APTITUDES

It may not be possible here to describe the study in great detail because our focus is to work out psychological strategies based on the findings. To be brief, the investigation was aimed at finding out the truth in the popular belief that students of lower socio-economic strata, particularly scheduled castes are inferior to those belonging to higher castes and classes in their general mental ability and aptitudes more for the reasons of their low genetic endowment than impoverished environment. The racist psychologists like Jensen, Burks and others (Jensen, 1969; Burks, 1928; Shuey, 1958; Coleman, et al., 1966; Ornstein, 1965) claim that heredity is the determining factor of intelligence and the Whites have higher IQ than Blacks. They found in their studies that there was consistent differences of 15 IQ points in favour of the Whites. Contrary to this view, Loochin et al. (1973) point out that the observed average difference in the scores of members of different US racial ethnic groups on intellectual ability tests probably reflect in part inadequacies and biases in the tests themselves. These psychologists, who are critical of the genetic position, believe that:

1. Environmental differences have not been given sufficient weightage by Jensen and others who swear by the genetic position.
2. Special programmes for the disadvantaged have either been inadequate in scope or incorrectly assessed.
3. Not enough is known about the heredity mechanism in intelligence to conclude that the Blacks are genetically inferior.
4. Nature of intelligence itself is not sufficiently well understood to permit valid racial comparisons on the basis of existing tests.

There are a few Indian studies (S. Chatterji, Manjula Mukherjee and S.N. Banerjee, 1972; Rangari A. and Palsane, M.N. 1982) though not exactly on the lines mentioned above, which point out that the caste status of an individual is an important factor in causing differences in the IQ of socially disadvantaged students and somewhat more advanced groups of the population. A study carried out by Rangari and Palsane, 1982; on 1197 students from seven senior colleges in

Aurangabad, for instance, has revealed pronounced differences between the IQ of scheduled caste and non-scheduled caste groups of students were mainly due to school achievement, the latter group obtaining higher scores on scholastic achievement tests. However, none of the Indian studies mentioned here, had gone into the basic dilemma of heredity vs. environment in causing the differences in the innate abilities of the students tested.

### HYPOTHESIS

The study commenced with the null hypothesis that there are no significant differences in the general mental ability and aptitudes of the scheduled caste and non-scheduled castes. However, there may be differences in their achievement in school subjects.

### METHOD

Psychological tests in Telugu that were specially developed for the purpose were employed for measuring different types of abilities of students like:

1. General Mental Ability (IQ)
2. Scientific knowledge
3. Numerical ability
4. Mechanical reasoning
5. Scholastic achievement in mathematics and sciences
6. Study skills

The tests employed in the study may be mentioned as follows:

1. Group Test of General Mental Ability, developed by K. Ravichandra
2. Scientific Knowledge and Aptitude Test, developed at EVGT Project Centre
3. Mechanical Reasoning Test, adopted into Telugu from Bennett's DAT battery
4. Numerical Ability Test, adopted into Telugu from Bennett's DAT battery
5. General Mathematics Scholastic Achievement Test, developed at EVGT Project
6. General Sciences Scholastic Achievement Test, developed at EVGT Project
7. Study Skills Inventory, developed by P.V. Ramamurthy

### SAMPLE

The sample in the present investigation comprised students of Classes IX and X of a number of schools in Andhra Pradesh. It consists of both scheduled caste

and non-scheduled caste categories with comparable school and living conditions. In a way they were controlled on all vital factors like age, sex and school grade, except caste and socio-economic status. The break-up of the sample varied from test to test as shown below:

	Name of the Test	Sample	
		No. of Students in SC Groups	No. of Students in Non-SC Groups
1.	General Mental Ability	1596	634
2.	Numerical Ability Test	1576	613
3.	Mechanical Reasoning Test	1578	433
4.	Scientific Knowledge and Aptitude Test	1588	586
5.	General Mathematics Test	1587	460
6.	General Science Test	1574	460
7.	Study Habits Test	400	400

#### PROCEDURE

The research personnel of the EVGT Project visited the hostels and schools in a number of districts and taluk towns, and contacted the students personally in order to administer the tests. Full precautions were taken in establishing rapport with them. Testing was done in groups adhering to the instructions of each and every test.

The data were statistically analysed for the purpose of making comparisons between scheduled caste and non-scheduled caste students.

#### RESULTS AND DISCUSSION

The data are presented in the tables given below:

TABLE 1 Mean, SD, SE and 't'-values of Scores of Scheduled Caste and Non-Scheduled Caste Students on General Mental Ability		
	SC Group N = 1596 SE	Non-SC Group N = 634 SE
Mean	19.77 $\pm$ 0.16	20.11 $\pm$ 0.22
SD	6.52	5.72
't'	1.15	

**TABLE 2**  
**Mean, SD, SE, and 't'-values of Scores of Scheduled Caste and Non-Scheduled Caste Students on Numerical Ability Test (DAT)**

	SC Group N = 1576 SE	Non-SC Group N = 613 SE
Mean	13.88 ± 0.12	14.43 ± 0.27
SD	5.03	6.78
't'	1.82	

**TABLE 3**  
**Mean, SD, SE and 't'-values of Scores of Scheduled Caste and Non-Scheduled Caste Students on Mechanical Reasoning Test**

	SC Group N = 1578 SE	Non-SC Group N = 433 SE
Mean	20.01 ± 0.15	20.23 ± 0.20
SD	6.09	4.24
't'	0.81	

**TABLE 4**  
**Mean, SD, SE and 't'-values of Scores of Scheduled Caste and Non-Scheduled Caste Students on Scientific Knowledge Aptitude Test**

	SC Group N = 1588 SE	Non-SC Group N = 586 SE
Mean	16.46 ± 0.17	17.12 ± 0.32
SD	6.87	7.91
't'	1.78	

**TABLE 5**  
**Mean, SD, SE and 't'-values of Scores of Scheduled Caste and Non-Scheduled Caste Students on General Maths Test**

	SC Group N = 1587 SE	Non-SC Group N = 460 SE
Mean	15.33 ± 0.13	19.25 ± 0.28
SD	5.32	6.75
't'	11.49*	

**TABLE 6**  
**Mean, SD, SE and 't'-values of Scores of Scheduled Caste and Non-Scheduled Caste Students on General Science Test**

	SC Group N = 1574 SE	Non-SC Group N = 460 SE
Mean	20.56 ± 0.20	24.92 ± 0.31
SD	8.20	6.72
't'	11.78*	

\* 't' ratios that are significant beyond 0.01 level.



It is evident from the first four tables showing the comparative profiles of the scheduled caste and non-scheduled caste students on innate abilities like IQ and aptitudes, that there are no significant differences between the two groups of students. However, pronounced differences can be noted between them in scholastic achievement in subjects like mathematics and sciences (see Tables 5 and 6). Item-wise frequencies were computed for the responses of scheduled caste and non-scheduled caste students separately on Study Skill Inventory. Chi-square values were computed between the problem and non-problem responses for each group, following the  $2 \times 2$  fold contingency procedure and are shown in Table 7.

<div>TABLE 7</div> <div>Chi-square Showing the Difference between the Frequencies of Problems of Study Skills between Scheduled Caste and Non-Scheduled Caste Students</div>							
		S.No. of Item in the Study Habit Scale	Frequency of Problems and Non-problems				Chi-square Value
			SC		Non-SC		
			Yes	No	Yes	No	
I	Reading and writing comprehension	1	226	174	220	180	0.09
		2	145	255	135	265	0.027
		3	281	119	131	269	5.60*
		4	123	277	94	306	2.65
II	Concentration	5	130	270	288	118	0.57
		6	88	312	137	263	1.42
		7	311	89	164	336	100.08*
		8	145	255	254	146	29.70
III	Time budgeting	9	285	115	239	161	5.85*
		10	123	277	164	236	4.56*
		11	306	94	254	146	2.01
		12	200	200	150	250	0.06
IV	Examination-taking behaviour	13	167	233	154	246	0.45
		14	170	230	146	254	15.06
		15	120	280	120	280	0.00
		16	218	182	211	189	1.23
		17	223	177	217	183	0.09
V	Miscellaneous	18	225	145	246	154	0.21
		19	263	137	242	158	0.02
		20	174	226	183	217	0.20
		21	250	250	140	260	0.27
		22	128	272	110	281	0.24
		23	204	196	178	222	1.69
		24	224	176	190	210	2.89
		25	105	295	56	335	5.97*
* Chi-square significant at 0.01 level							

TABLE 3  
Summary Table of Tuckey's HSD Values for Mathematics

	Study Skills and Tutor	Only Tutor	Control Group	$F = (2,93) = 12.16$
Study skills and tutor	—	27	77	
Only tutor	—	—	50	
Control group	—	—	—	

F-test was performed on gain scores in science.  $F(2,93) = 9.42$ ,  $Mss = 2.07$  was obtained. This F ratio is highly significant. Tuckey's HSD test was performed on mean of gain scores. Group I which was exposed to training in study skills and remedial tutoring in science performed significantly better than experimental group II, which was exposed to only remedial tutoring. Experimental group I differed significantly with the control group which was not exposed to any kind of treatment. Experimental group II differed significantly than the control group in terms of their gain scores in science. These results also suggested that in comparison to the performance of experimental group II, the performance of experimental group I was significantly better. These results suggested that imparting study skills in combination with tutor may create a better effect in enhancing the performance of the students in science, compared to a group which has been provided only the tutor. The group which has not been exposed to any treatment (i.e. neither study skills nor remedial tutoring) performed very poorly. On the basis of these results we can conclude that imparting study skills in combination with remedial tutorial will enhance performance of students in their school subjects. Similar results were noted regarding student performance in mathematics (*vide* Table 3).

As can be seen from this experiment, imparting study skills has resulted in improvement in the gain scores both in science and mathematics. The results of the present study indicate that the group which has been provided tutor has performed better than the students in the control group condition where the students were not provided either study skills or tutor. This study established beyond any doubt that imparting study skills and providing remedial tutoring will improve the performance of the students in their academic attainment.

#### IMPLICATIONS

It is heartening to note that despite adverse living and schooling conditions and earlier deprivations in socialization the scheduled caste students in our investigation have shown no significant differences in their General Mental Ability and

Aptitudes in comparison to the students from general population. However, they were very poor in their performance in school subjects like mathematics and science. This only shows that they do not lack in abilities but they certainly lag behind the non-scheduled caste students in scholastic achievement. The reasons for educational backwardness in the socially disadvantaged children, as pointed out by Newton S. Mettessell and J.T. Foster (1965), are:

1. Lack of awareness of the 'ground rules' for success in school setting.
2. Inability to make simple symbolic interpretations.
3. Short attention span in the disadvantaged children resulting in difficulty in following directions in the classroom.
4. Inflexibility in language usage.
5. Difficulty in developing size concept and number concept.
6. Difficulty in perceiving adults as people to whom they can turn for help.
7. Low level of curiosity about things.
8. Narrow range of experiences because of low level of interaction with children from other socio-economic strata.

Over and above the reasons mentioned here, it is generally observed that socially disadvantaged children are likely to feel isolated from middle class culture represented by the teacher and school and, therefore, their need to belong is undiminished. It is not surprising to note that need affiliation is greater in them than need achievement. Further, the experiments on creative thinking in socially disadvantaged children (Roger A. Johnson, 1975) have demonstrated that rewards produce better results in them as compared to middle class children and that too material rewards were found to be more effective with them.

In the light of the findings of several studies, including our own, on socially disadvantaged children, the following psychological strategies for their educational development may be considered:

1. Since home is the most important factor that can make or mar the personality of a child in early stages of development, steps must be taken to enrich the home conditions of the disadvantaged.
2. Exclusive hostel system for one caste or community will do more harm than good and, therefore, it is necessary for the government to create mixed hostels by admitting students from different castes and classes. This will certainly ensure the integration of the socially disadvantaged with the main stream.
3. Building up ego strength in the disadvantaged children is the primary and essential step to be taken up by the hostel warden as well as the classroom teacher. This will pave way for developing high self-esteem and self-confidence in the children. This can be achieved mostly by rewards and recognition and not by punishment.

4. Several studies have proved that immediate rewards are better than delayed rewards for effective learning by the children and more so in the case of deprived children.
  5. Since the socially disadvantaged children possess more n-affiliation than n-achievement, it is necessary to have judicious combination of these two in making classroom teaching more interesting and effective.
  6. Our studies and experience reveal that scheduled caste students require a good deal of personal and individual attention in grasping concepts, and therefore, it is necessary to have special tutorial system in social welfare hostels, particularly in difficult subjects like mathematics and science.
  7. A great majority of problems lie in faulty study habits and, therefore, it is necessary to expose the children to effective study skills by conducting short-term workshops for them.
  8. Supplementary reading material in the form of special packages with lucid explanation of concepts and problems must be provided to the children which can be of use in and outside classroom hours.
  9. The most important element in the teaching-learning paradigm is teacher and, therefore, it is necessary to train the teacher in changing his conservative attitudes towards the low caste children. This can be done through short-term workshops.
- On the whole, more than the classroom, it is outside classroom intervention that goes a long way in making the socially disadvantaged child an effective learner.

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## Book Reviews

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### Popular Education

#### Popular Education and Its Discontents

Lawrence A. Cremin, Harper and Row, New York, 1990, pp. x + 134, U.S.\$17.95.

THE book under review forms the substance of the Inglis and Burton Lectures delivered by Cremin at Harvard Graduate School of Education in March, 1989. Here the author deals with the current predicament of American education especially in schools and colleges. The conflicts in education arise from the very different teaching of families, schools and television broadcasts and the difficulties posed by the long-standing tendency of Americans to try to solve their political problems through education. There have been three abiding characteristics of American education: popularisation, multitudinousness and politicisation. Though none of these characteristics has been uniquely American, yet three have been associated with some of the formidable achievements of American education and, at the same time, they have created some of its most intractable problems. These three essays deal with the combination of achievements and problems and their bearing on the present-day educational policy. This book stands as a coda to Cremin's trilogy of *History of American Education*.

The popularisation of American education since the end of World War II has been phenomenal. The schools are catering to more diverse student bodies, with more diverse needs, abilities and styles of learning. During the 1970s there was suspicion that American standards were falling behind in international competition, while more people were going to school for ever longer period of time. The

suspicion was confirmed in the 1980s by the National Commission on Excellence in Education—*A Nation At Risk*. There has been unprecedented broadening of excess, diversification of curricula and extension of public control. Cremin writes that standards involve much more than determination of what knowledge is most worthy, they also involve social and cultural differences and they frequently serve as symbols for these differences. On the eve of World War II, the normal expectation for the average American child was the completion of the elementary school and continuation on to some secondary schooling. George Counts pleaded for the extension of Universal Education through secondary level and recommended appropriate broadening of high school programmes. The educators talked about holding powers of schools but dropouts increased both at elementary and secondary levels.

The post-World War II popularisation of schooling combined two elements: drive to make secondary education universal, and to extend the opportunities for higher education to all who wished it and were qualified. Even within this context of broadening and popularised offering, many students were dissatisfied with the institution itself and its programmes. During the 1960s free school movement expanded to embrace higher education. With this came changes in the education policy documents of the 1970s. Cremin notes that the popularisation of programmes has not kept pace with the popularisation of access. There is a need to reconnect the system with the life of the society and to tailor education to individual needs and backgrounds.

For the various commissions of the early 1980s, the popularisation of education has been an utter and complete failure because it brought with it declension and degradation. In the domain of higher education the three recent reports lamented the absence of a clear vision of the educated person at the heart of undergraduate education. The crisis of American schooling is rather a crisis inherent in balancing the tremendous variety of demands Americans have made on their schools and colleges. Cremin believes that there is a need for a far greater sense of unity in the American school system, one that envisions the system as a whole extending from nursery school through portals of higher education with individuals making their way through the system according to their own lights and aspirations, and institutions creating their clients completely much as they do today.

In *Cacophony of Teaching*, Cremin explores the radical changes that have occurred in non-school institutions of education provided by families and work places and television broadcasts. Schools and colleges cannot accomplish educational tasks of a modern post-industrial civilisation on their own. A broad approach that considers schools and colleges as crucially important but not solely responsible for teaching and learning is needed. There have been profound changes in the rearing of children and in the nature, uses and delivery of information throughout

the society. Judging by the changes in the structure, composition and character of American families, one would expect a far greater range and diversity of early education.

Television has influenced familial education and it has strengthened the bonds of adolescent peer groups. Adolescents constitute a separate society, distinct from adult society and it leads to conflicts between values and attitudes of that society and parental values and attitudes. Day care centres can perform their roles from custody to recreation to social and educational development. In this, Black churches in some cities have played an important role. Besides entertaining, television has demonstrated an ability to carry out formal teaching. Television has provided educational programmes at all levels with and without credits.

The United States is in the midst of a transition from an industrial to a service and information economy, which is affecting every aspect of American life. Today roughly half of the American work force is occupied with "processing of knowledge". Its educational implication is that one must be able to read and write and calculate. In effect one must have the elementary skills of communication, to deal with information. We need to know more about the fit between schooling and needs of American economy. Many corporations have initiated their own programmes for education and training of their work-force at various levels. The essence of a good deal of familial education is informal tuition, modelling, explaining and correcting. The essence of most school education is systematic instruction. The form of television education ranges from subtle and not so subtle bombardment of commercial to the more dramatic and comprehensive instructions of documentaries. The forms of education in the work-place range from pure imitation as an apprentice to informal training as an understudy to formal instruction in the classroom.

The numerous policy recommendations during the 1970s and 1980s in the domain of childcare, television broadcasting and work-place training have tended to deal with problems piecemeal and without relation to one another. Cremin asks if it is possible to craft a set of policy recommendations that deal with education more comprehensively and that links the various parts of the education system more effectively. The youngsters were profited by the 'Headstart' programme, but only fewer than 20 per cent of the children living in poverty were being served by the programme. The most significant drift of the TV policy during the 1970s and the 1980s was towards deregulation on the part of the Federal Communication Commission. The recommendations of the three policy documents of the 1970s were not taken seriously.

Not much attention has been paid in the policy literature during the past two decades to issues concerning education in the work-place. The measures like worker participation in decision-making, re-designing of jobs and re-allocation of



responsibility for the definition of jobs may lead to improved productivity and may provide training in participation in the affairs of the society at large. Needless to say, the employees should recognise the obligation to develop the literary proficiency of existing employees. It is suggested that formal institutions of education have to work in concert with families, civic agencies, telecommunication facilities, cultural institutions and work-places if their programmes are to be realistic as well as academically respectable. Such a restructuring involving all institutions in education across the entire life space is fundamental in many ways, but is difficult to achieve. But such a restructuring will bring together the educational opportunities the Americans require.

The tendency of the Americans to try to solve certain problems through education, rather than directly through politics, places enormous burdens on schools and colleges. It raises hopes and expectations and makes education as the most fundamental aspiration of society. It calls for a much more extensive body of tested knowledge about the institutions and the process of education than is available at present. Cremin writes that in the absence of such a knowledge, it is folly to talk about excellence in American education. Education serves as a political function, as it is intended to affect the future character of the community and the state. The politicisation of education has torn colleges and universities apart from time to time during the post-World War II era. The same is true of the political crisis over family and childcare policy. Conflict over women's rights and for telecommunication policy with respect to children's programming. The tendency to solve political, economic and social problems through education resulted in casting education as a leading weapon in fighting against race discrimination, war on poverty to drive for political and economic competitiveness. The Brown decision of 1954 brought changes in education that made differences in how children thought, felt and behaved when they became adults.

About the effort to use education as an instrument to achieve economic competitiveness, the author writes that the skills of literacy and critical thinking are essential for a modern economy. But to contend that the problems of international competitiveness can be solved by educational reforms alone is not a sound proposition.

The dynamics of Americanisation were essentially the dynamics of discordant education. There was persistence of discordant education throughout the 19th and the 20th century. There seemed to be no doubt about the need to learn English, understand the constitution and live productively with the law, but beyond that both the models and principles were frequently unclear. As a result of vast immigration, a more pluralistic and multi-cultural definition of Americanisation emerged. Gradually provision was made for bi-lingual and bi-cultural educational programmes for children of limited English-speaking ability. But soon, opposition

to bi-cultural and bi-lingual education grew and there was emphasis on the teaching of civics in general and American history in particular.

It is held that certain educational tasks must be performed by childcare centres, schools, colleges, television broadcasts and other educative institutions if citizens are to acquire knowledge, values, skills and experience to act intelligently and responsibly on matters of public concern. The author pleads for allocation of more funds for educational research and points out the areas that need attention, viz. social organisation of schools, individualising of instruction, measurement of academic achievement and teaching of reading and writing skills. The aim of education should be to make human beings who will live life to the fullest, who will continually add to the quality and meaning of their experience and to their ability to direct that experience and to participate actively with their fellow human beings in the building of a good society. Though it is not a small task in the future, but there is no more important political contribution to be made to the health and vitality of American society.

In sum, Cremin has covered a vast ground. It is hoped the book would be found useful by Indian educational planners, educators and social scientists and that it will enable them to have a fresh look at our socio-political and educational problems in the light of American experience.

P.C. BANSAL

## Teacher Education

### Indian Year Book on Teacher Education

. Kundu, C.L. (ed.), Sterling Publishers, New Delhi, 1988, pp. 467, Rs 250.00.

**W**RITING a year book is a stupendous task. It takes a variety of forms and involves indepth studies, case histories, experiments, on-the-spot investigative reporting, horizontal as well as vertical perspective profiles of individuals and institutions along vital dimensions of the subject in hand, and indeed, the whole lot of success stories over a period of time. It seeks to serve as a potential source book supported by authentic and meticulously documented material for objective and scientific use by researchers and scholars interested in the subject. It prunes the

content for its strengths and shortcomings, superfluous overlappings and dead-wood, and presents, in short, a consistent, coherent and comprehensive picture of the various viewpoints to help enrich the study of the subject further on.

The title under review, though captioned as *Indian Year Book on Teacher Education*, barely satisfies the criteria of being in the nature of a year book. A quick perusal of its contents would reveal that it carries at places papers that have no relevance whatsoever to teacher education, nor to the new education policy, the focal point of the title. For instance, papers at pages 51-64, 74-79, 244-254, 265-275, 285-286, etc. seem to be redundant. This is quite likely to happen when papers written for an occasion such as an annual conference of a body like Indian Association of Teacher Educators are printed in the guides of a year book which not only flouts the very spirit of what constitutes a year book but also belies, in turn, the seriousness of purpose underlying its making. In its present frame, the title had better been captioned as "Stray Notes on Teacher Education" to obviate any tendency to misinform the reader who merely goes by the cover page.

Divided into nine sections as per the table of contents, the division gets lost in the body of the text as neither any distinct section-wise content distribution is strictly kept up nor are the sections clearly defined in any way anywhere. The result is overlapping of dead-old issues, problems and quotes all over. A few illustrations might do. The overall burden of most of the papers lies in projecting a very low profile of teacher education at all levels and grades vis-a-vis cynicism involved in 'teaching the last resort' myth repeatedly put forth in the title. Besides a host of untenable sweeping statements without any adequate evidence in support, there is an underlying tendency in most of the papers to be wellnigh hypothetical resulting, more often than not, in elusive interpretations and far-fetched conclusions. At places, paras after paras, and even pages after pages have been lifted/quoted without any proper relevance, acknowledgement or documentation. Pages 134, 147-153, 178-182, 210, among others, refer to in this context. Similarly, there are also too many too sketchy papers, as at pages 51-64, 74-79, 86-87, 113-120, 142-153, 186-190, 199-205, etc., to deserve a place in the title. On the whole, the overall intellectual level of sporadic research reported in the book is, by and large, far from being up to the mark. Even more disappointing is the far-flung linkage of many a paper with the new education policy while in a number of others, the authors seem to be satisfied with mere annotation, compilation and summarisation of the NPE and POA documents. Besides communication and language lag, a number of typographical errors also mar the merit of the book. So do many an omission in the preparation of the index, as words like Marxist, Gandhian, Brunner, Socrates, etc. at page 186 do not find reflection in the index. Obviously, the title suffers from the objection of being produced as though in a great hurry.

However, despite the whole lot of pessimistic notes and the glaring non-availability of a suitable paper to serve as a valid flash back into the historical perspective of teacher education in the country, the underlying thrust is apparently on some kind of a radical transformation that liberates teacher education from its deep-seated maladies and shortfalls, that rejuvenates it to the realization of its intrinsic purpose, namely, preparation of highly motivated quality teachers who not only possess profound professional acumen but also wholesome personal culture. Among various measures suggested are modification of syllabi and curricula, alternative systems, strategies and institutions, technological input and human resource development, innovative management models and pedagogy of communication in teacher education, etc. And although many of the major institutions and strategies are referred to in passing in this set of papers, there is, however, no evidence of suggesting any concrete alternative model or approach matching the cherished task. The title as such leaves much to the imagination of the reader by keeping open a kind of Pandora's box of problems and issues facing teacher education today which though discussed time and again by different committees, commissions and documents but not much to purpose as the authors of the title tend to maintain. The sole merit of the title thus lies in highlighting the need for a continuous search of answer to parallel as well as perennial problems of teacher education, and in that context, it may interest anyone who wants to know about different issues in this field. Its possession by institutional libraries may therefore be quite useful.

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